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PACIFIC BELL TELEPHONE COMPANY

UNITED STATES DISTRICT COURT

EASTERN DISTRICT OF CALIFORNIA

CALIFORNIA SPORTFISHING PROTECTION ALLIANCE,

Plaintiff,

v.

PACIFIC BELL TELEPHONE COMPANY,

Defendant.

Case No. 2:21-cv-00073-MCE-JDP

DECLARATION OF NAVI SINGH DHILLON RE PACIFIC BELL'S NON-OPPOSITION TO PLAINTIFF'S REVISED AND SHORTENED SCHEDULE

Judge: Hon. Jeremy D. Peterson
Date: January 25, 2025
Time: 10:00 a.m.
Courtroom: 9

Action Filed: January 14, 2021

I, Navi Singh Dhillon, declare as follows:

1. I am a Partner at Paul Hastings LLP and counsel for Defendant Pacific Bell Telephone Company (Defendant). I make this declaration in support of Defendant's non-opposition to Plaintiff's proposed revised and shortened case schedule. Unless otherwise indicated, I have personal knowledge of the matters set forth below and, if called as a witness, I could and would testify competently thereto.

2. Attached as **Exhibit A** is a true copy of Ramboll US Consulting, Inc.'s "Lake Tahoe Sediment Lead Study," dated August 24, 2023.

I declare under penalty of perjury that the foregoing is true and correct and that this declaration was executed on February 8, 2024, in San Francisco, California.

By: /s/ Navi Singh Dhillon
NAVI SINGH DHILLON

Exhibit A

Prepared for
AT&T

Prepared by
Ramboll US Consulting, Inc.
Los Angeles, California

Project Number
1690031058

Date
August 24, 2023

LAKE TAHOE SEDIMENT LEAD STUDY

LAKE TAHOE, CALIFORNIA

RAMBOLL

CONTENTS

TABLES

FIGURES

FIGURES *(Continued)*

APPENDICES

1. INTRODUCTION

Ramboll is a global consulting firm with specialized expertise in environmental matters. We were retained on behalf of AT&T to collect nearshore sediment samples from Lake Tahoe and to evaluate sediment quality in the vicinity of two lead-clad telecommunication cables in the lake. This study was performed by scientists with expertise in the design and execution of sediment quality studies.[1]

In these cables, a copper wire core is surrounded by a quarter-inch thick lead sheath to protect the copper from environmental elements. The lead sheath is in turn covered by a further protective steel layer.

In July 2023, Ramboll undertook a sediment investigation to determine the potential for the telecommunication cables in Lake Tahoe to contribute to metals concentrations in sediments. This study was particularly focused on sediment lead concentrations but included other metals as well. Results of this study determined that lead concentrations in nearshore Lake Tahoe sediments were very low at all locations sampled. All lead measurements were within or below the value range generally accepted as background concentrations for freshwater sediments of 4 to 17 mg/Kg (parts per million), and far below published and accepted ecological toxicity thresholds (Buchman 2008). Lead concentrations collected closest to all cables (e.g., within 15 cm of the cable) ranged from 0.659 to 7.57 mg/Kg. Lead concentrations at reference locations ranged from 0.548 to 2.45 mg/Kg, while concentrations at beach sites ranged from 0.920 to 1.400 mg/Kg.

[1] CVs of the study team are appended to this report.

2. METHODS

Ramboll located the two telecommunication cables in Lake Tahoe. One cable (Cable A) stretches across the mouth of Emerald Bay. The second cable (Cable B) runs generally from north to south near the western shore of the lake. Sampling points were chosen to collect data near both cables as well as a series of reference sites and beaches. The focus of this study was to analyze sediments for metals, organic carbon, solids content, and sediment grain size at each station. Sediment samples were collected by hand placing clean butyrate tubes at a selected location. The tubes were 6 inches long and 2 inches wide. Multiple tubes were placed at each location to ensure sufficient sample was collected.

2.1 Sediment Collection and Sample Locations

The Ramboll team arrived in South Lake Tahoe on July 10, 2023. Sampling was conducted on July 11 and 12, 2023. A total of six stations near the cables were sampled. Three stations were adjacent to Cable A and three stations were adjacent to Cable B (Figure 2-1). While only two stations (SED4 and SED5) were planned for Cable A, the field team added a station near the southern end of Cable A at SED5. This station was designated SED5-END (not shown on Figure 2-1).

In addition, samples were collected at three reference stations and four beach stations (Figure 2-1). For each of the cable and reference stations, the team returned to the same locations as were used in the water sampling study from June 2023 (Ramboll 2023).

Figure 2-1: Sample Locations

2.2 Sediment Collection Methods

Upon arrival at a particular sampling station, the boat was positioned near the sampling location, making sure that turbulence from the boat did not impact sediment conditions near the cables or other sample sites. For deeper sampling locations water depth was measured. Water depth at the beach sampling locations was estimated by the field team. Prior to collection all sampling tubes (hand cores) and sample jars were labeled and checked for quality assurance. The GPS coordinates were recorded, and the sampling crew prepared for collection. Following collection at each station, three unique viewpoint photographs were captured from the boat or beach to record distance from shore, conditions, and imagery of the sampling location.

Prior to collection and use in the field all sample tubes and caps were decontaminated and sealed. This consisted of a series of steps: (1) wash sampling equipment with laboratory quality soap (e.g., Alconox); (2) rinse sampling equipment with site water; (3) rinse sampling equipment with 20% nitric acid; and (4) rinse sampling equipment with distilled water. Following decontamination, the sample tube caps were placed on the tubes and all tubes placed into clean plastic bags for deployment. Sample tubes were never re-used in the field without prior decontamination.

2.2.1 Cable Stations

For each sample at each cable station, up to five core tubes were used to collect sufficient sediment for physical and chemical analysis (See Section 2.5). Where the cable was present, cores were placed at three distances from the cable (within 15 cm, 1 m, and 2 m). Sealed core tubes were transported by the field team, unsealed, and placed into the sediment approximately 5 cm in depth at a distance of 3 to 15 cm from the cable. Great care was made to place tubes slowly to avoid disturbance of both the sediment and materials on the cable. Once in place, a 1 m measuring bar was used to place an additional five tubes at a distance of 1 m from the cable. Finally, moving the measuring bar again a final five tubes were placed at a distance of 2 m from the cable. The cores closest to the cable were designated "A" samples, the cores at 1 m were designated "B" samples, and the cores at 2 m were designated "C" samples.

Following complete placement of the tubes, the orientation and placement of the core tubes were documented by either underwater video with a GoPro camera or an underwater Olympus digital camera.

Each core tube was extracted carefully by removing and immediately capping the tube to avoid the loss of material. Sealed tubes were placed in a bag and returned to the boat crew for processing.

2.2.2 Reference Stations

Three reference stations were positioned at the same locations as were used in the water study (Ramboll 2023). At each station, a total of five core tubes were placed into the sediment following the same procedure described for the cable stations. Following photographing the site, sediment tubes were extracted and capped and then returned to the vessel crew for processing.

2.2.3 Beach Stations

Four beach stations were used to collect sediments from the bathing/wading area of public beach access areas in Lake Tahoe. At each station, because the sampling points were within

a "no boat zone", the sampling crew was dropped off outside of the zone and the team swam into the beach with sealed sampling tubes. Tubes were unsealed and placed in the shallow area of the beach in approximately 1 to 1.5 feet of water. Each tube was extracted, sealed, and then returned to the vessel for processing. The field crew collected photos/video where possible to document the location and distance from shore in the public areas.

2.3 Sample Handling and Shipping

Clean sample bottles were shipped from ALS Environmental (ALS), located in Kelso, Washington. The kits contained sample bottles with waterproof labels, chains-of-custody, custody seals, and associated paperwork. Two types of sample bottles were used. First an unpreserved 16-ounce (oz) wide mouth glass bottle was used for metals, total organic carbon (TOC), and Total Solids measurements. The second bottle was an unpreserved 32 oz wide mouth glass bottle for grain size.

After returning to the boat with the collected samples, the field team randomly chose sample tubes from among the five tubes collected at each location and emptied the tube contents into the sample bottles. One sample tube was used for the metals, TOC, and solids analysis, and the remaining tubes were combined for use in the grain size analysis. As sample material was placed into the laboratory bottles, any large debris (e.g., twigs, leaves, live clams, or shells) was removed by hand prior to placing the sediment in the sample bottles. Bottles were labeled and placed on ice. Chain-of-custody forms were completed and maintained in custody with the samples. Wet ice was collected the morning of deployment to ensure proper temperature storage. All ice was double bagged using ZipLock bags to avoid direct contact between the ice and any sample bottles. All sample bottles were maintained in the dark in ice chests during the sampling event.

The team completed sampling on July 12, 2023. Samples were shipped the next morning (July 13, 2023) to ALS via priority overnight transit for analysis.

2.4 Physical and Chemical Analysis

ALS received the sediment samples on July 14, 2023. The samples were received intact, under proper chain-of-custody, and below 6 degrees Celsius (°C). ALS completed all analyses according to USEPA or ASTM protocols as required. Laboratory duplicates (i.e., samples that are split and analyzed twice by ALS) were also tested to verify precision in the analysis. This procedure verifies that the laboratory did not introduce variability or contamination. ALS thereafter reported the results of the lab testing. Testing was carried out on four sediment parameters. This included Total Metals following USEPA Method 6020B/7471B, TOC using Standard Method 9060, Total Solids using Standard Method 2540G, and grain size following ASTM Method D422M.

3. SAMPLE LOCATION DESCRIPTIONS

Sample locations are described in this section. Following collection of sediment in sample tubes at each location, tubes were processed in the boat by emptying sediment from tubes into sample bottles (i.e., sediment for Metals, TOC, and Total Solids in one sample bottle and sediment for grain size in another bottle).

3.1 Cable Station SED1

Station SED1 was characterized as shallow and nearshore, with clear water and sandy bottom. The cable is on the sediment surface or partially buried. The depth was approximately 8 feet 9 inches. This station was located at the northernmost end of Cable B. Samples were collected at SED1 using core tubes penetrating approximately 5 cm at three distances from the cable (A = 15 cm; B = 1 m; C = 2 m). At SED1 under water (UW) video (GOPRO) and surface photographs were collected. In order to better capture visual representation of the sampling location, three images from different viewpoints were taken (Figure 3-1). Each viewpoint is taken to record a distinguishing feature at the site and to provide a visual reference for the site location. Figure 3-2 provides a map of the location and characteristics of the site including photographs of the sample placement.

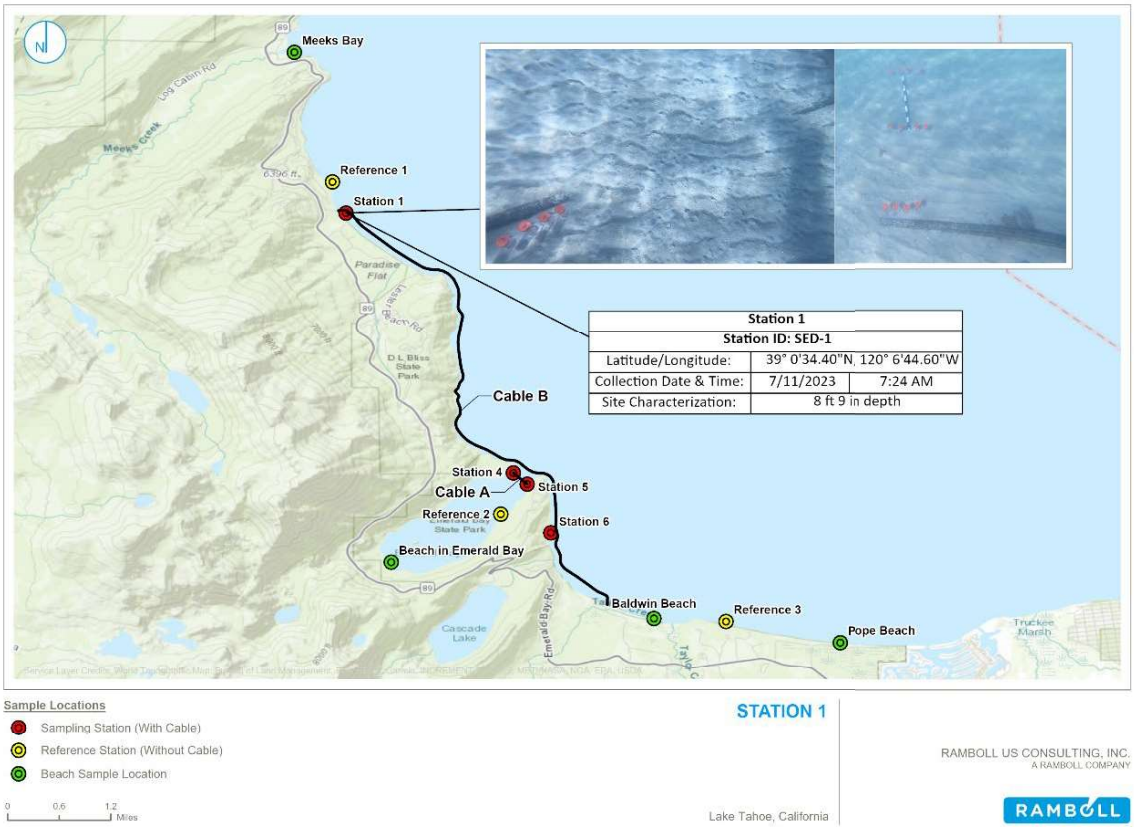
Figure 3-1: Station SED1 Viewpoints


Station 1 - Viewpoint 1


Station 1 - Viewpoint 2


Station 1 - Viewpoint 3

Figure 3-2: Station SED1 Location and Site Information



3.2 Cable Station SED4

This station is the north end of Cable A where it crosses Emerald Bay. The cable (Cable A) at SED4 is very shallow (i.e., less than 4 feet deep) and extends from shore out approximately 25 to 30 feet. The cable was located extending from shore to the offshore regions across the mouth of Emerald Bay. Cable A at this location is cut and there is an exposed section of the lead sheath surrounding the copper core. The steel wires surrounding the cable are bent back exposing the sheath and core. The exposed end of the cable stands above the lake bottom approximately 1 to 1.5 feet over an area of boulders and rock with sandy/sediment areas. Aquatic vegetation and wood debris is found throughout the area.

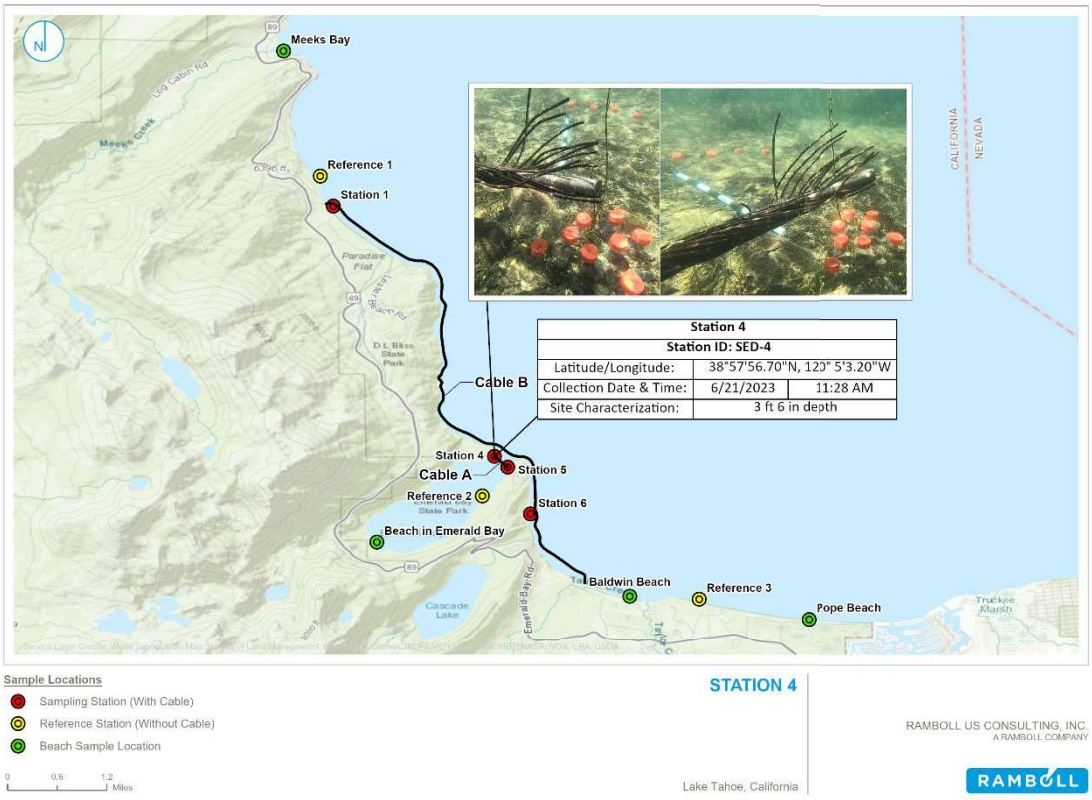
Sample tubes were placed at three distances from the cable and penetrated approximately 3-5 cm depending on substrate. The "A" distance sample was collected directly beneath the exposed lead core section of the cut cable, because the cable was elevated above the lake bottom by about 1.5 feet. A field duplicate sample at the "A" distance was also collected within 0-15 cm of the cable. A sample was collected at "B" (1 m) and "C" (2m) distances from the cable. The water depth at the "A" distance was approximately 3.5 feet dropping to about 4.5 feet at the "C" distance. The team collected UW video and surface photographs.

Figure 3-3 shows visual reference for the site location, and Figure 3-4 provides an overview of the site location with photographs and site details.

Figure 3-3: Station SED4 Viewpoints

Station 4 - Viewpoint 1	Station 4 - Viewpoint 2	Station 4 - Viewpoint 3

Figure 3-4: Station SED4 Location and Site Information



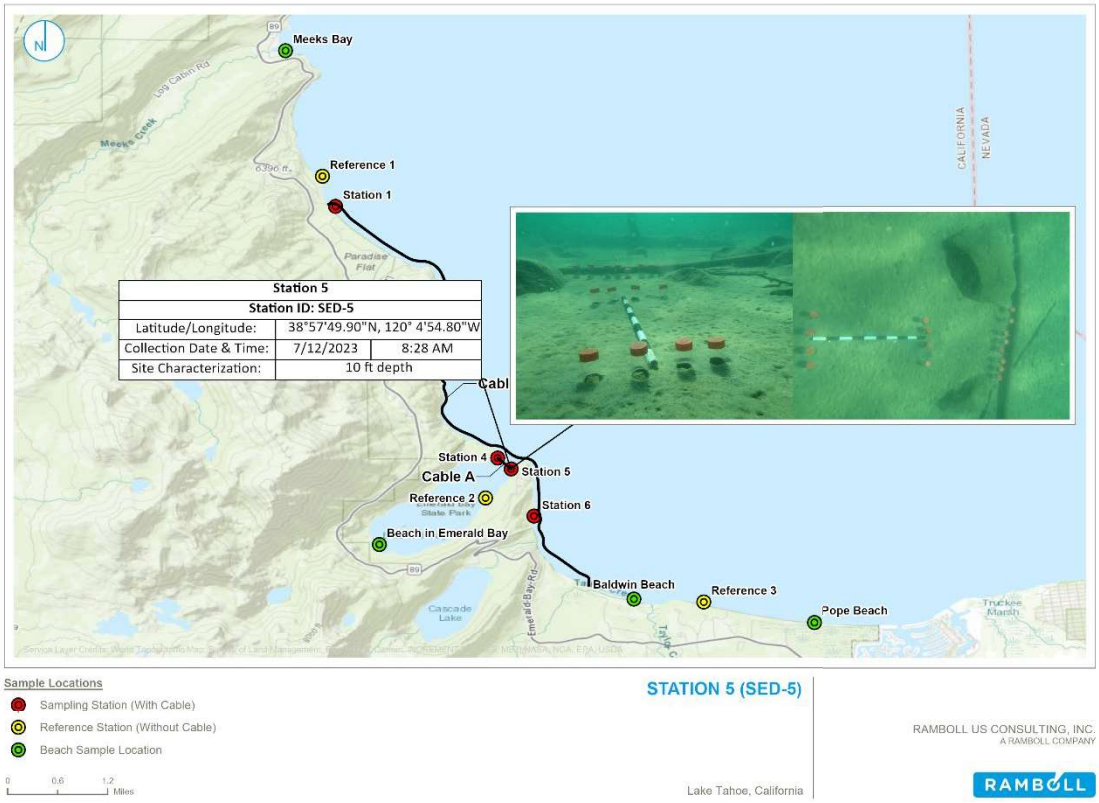
3.3 Cable Station SED5

This station is the south end of Cable A where it crosses Emerald Bay. The team located the cable in approximately 10 feet of water. The cable crosses a sand and gravel bank and then extends to a very rocky area. At a point where substrate under the cable was primarily sand and sediment, samples were collected at three distances from the cable (A = 15 cm; B = 1 m; C = 2 m). A field duplicate sample at the "A" distance (15 cm from the cable) was collected at SED5. A camera was used to document the location of the cable, site conditions, and location of all core tubes. Figure 3-5 shows the visual reference for the sampling location and Figure 3-6 shows site photographs and information.

Figure 3-5: Station SED5 Viewpoints

Station 5 - Viewpoint 1 | Station 5 - Viewpoint 2 | Station 5 - Viewpoint 3

Figure 3-6: Station SED5 Location and Site Information



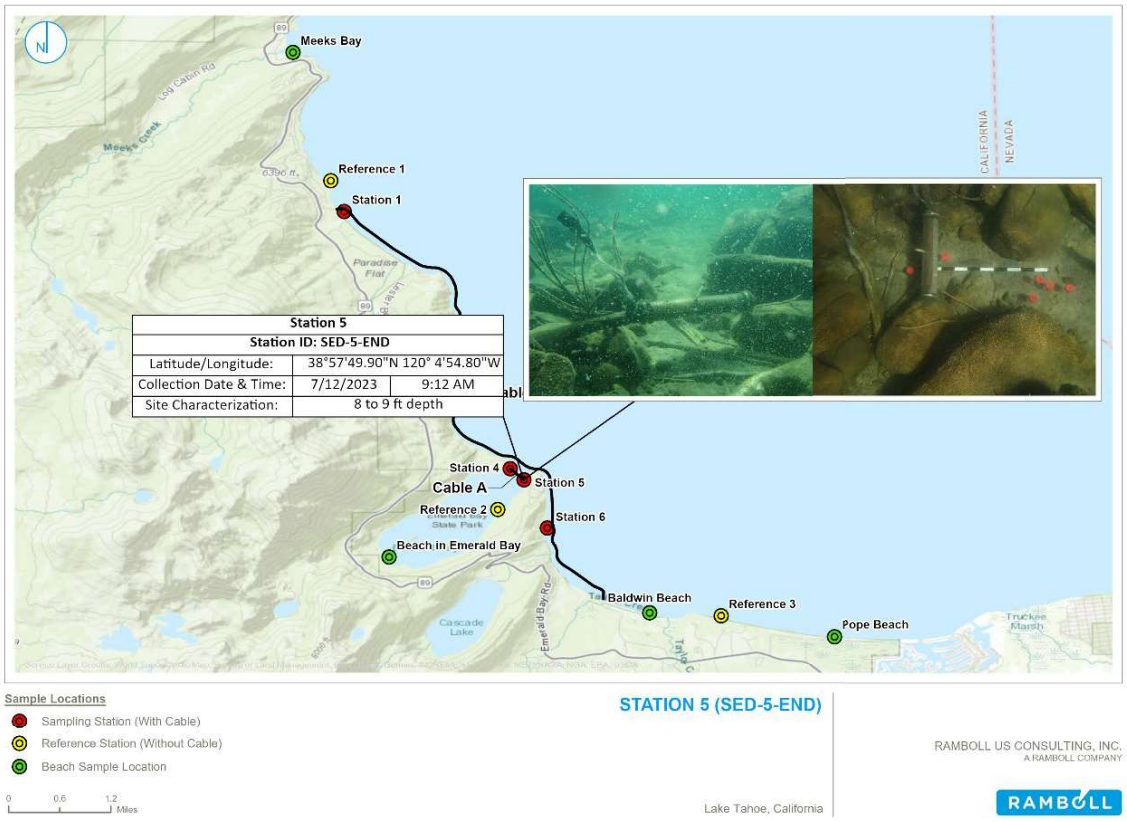
3.4 Cable Station SED5-END

When collecting the sample for SED5, it was noticed that the terminus end of Cable A was cut off and capped with a sealed plastic container. No visible markings were observed on the cable end cap. A decision was made in the field that this unexpected discovery warranted collection of additional samples under and near where the cable was cut and capped. This new station was designated as SED5-END. The cut and capped cable end of Cable A was elevated above the bottom and sitting over boulders that were interspersed with sandy sediments. Water depth at SED5-END was approximately 8 to 9 feet. A sample under the end cap was collected as the "A" sample, i.e., within 0 to 10 cm. Sufficient sediment existed 1 m from the cap to collect a "B" sample; however, the area 2 m from the cap at the "C" distance was primarily cobble and boulders and did not have sufficient sediment to collect a

sample. Therefore, samples at only two locations were able to be collected at SED5-END. Figure 3-7 shows the site orientation views, and Figure 3-8 provides site photographs and sample orientation. The cable, end cap, and tube configuration were documented with the camera.

Figure 3-7: Station SED5-END Viewpoints

Figure 3-8: Station SED5-END Location and Site Information



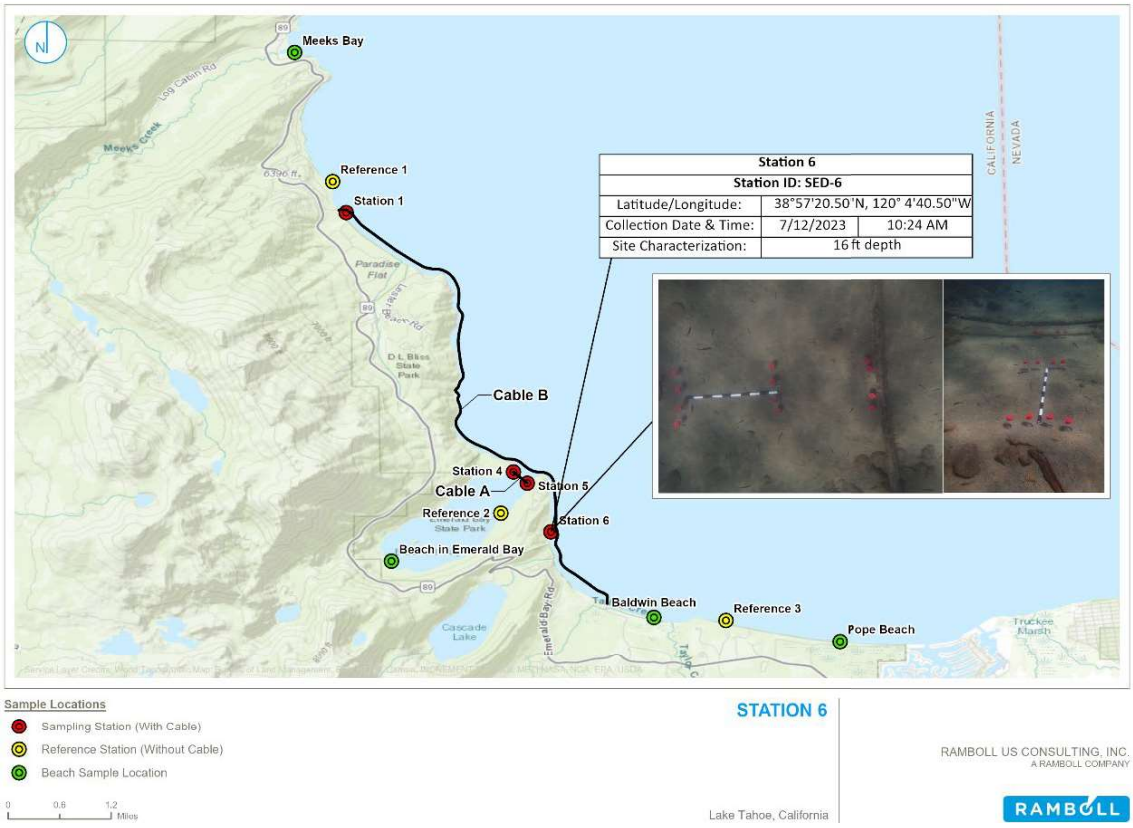
3.5 Cable Station SED6

Cable Station SED6 was at a section of Cable B along the southern shore of the lake south of Emerald Bay. In this area Cable B extends from depth (approximately 25-40 feet) to the north onto the shoreline area that is composed of a boulder field, doubles back on itself, and then extends back to the south into deeper water. A visual reconnaissance of the cable found that at an area farther offshore it sits over an area that is primarily sand. Water depth here was approximately 16 to 18 feet. In this area the cable is elevated 6 to 8 inches above the lake bed for a distance of approximately 5 to 8 feet. Three analytical samples were collected at the "A" (15 cm), "B" (1 m), and "C" (2 m) distances from the cable. Figure 3-9 shows the visual site location, and Figure 3-10 shows the sampling configuration and site information.

Figure 3-9: Station SED6 Viewpoints

Station 6 - Viewpoint 1 | Station 6 - Viewpoint 2 | Station 6 - Viewpoint 3

Figure 3-10: Station SED6 Location and Site Information

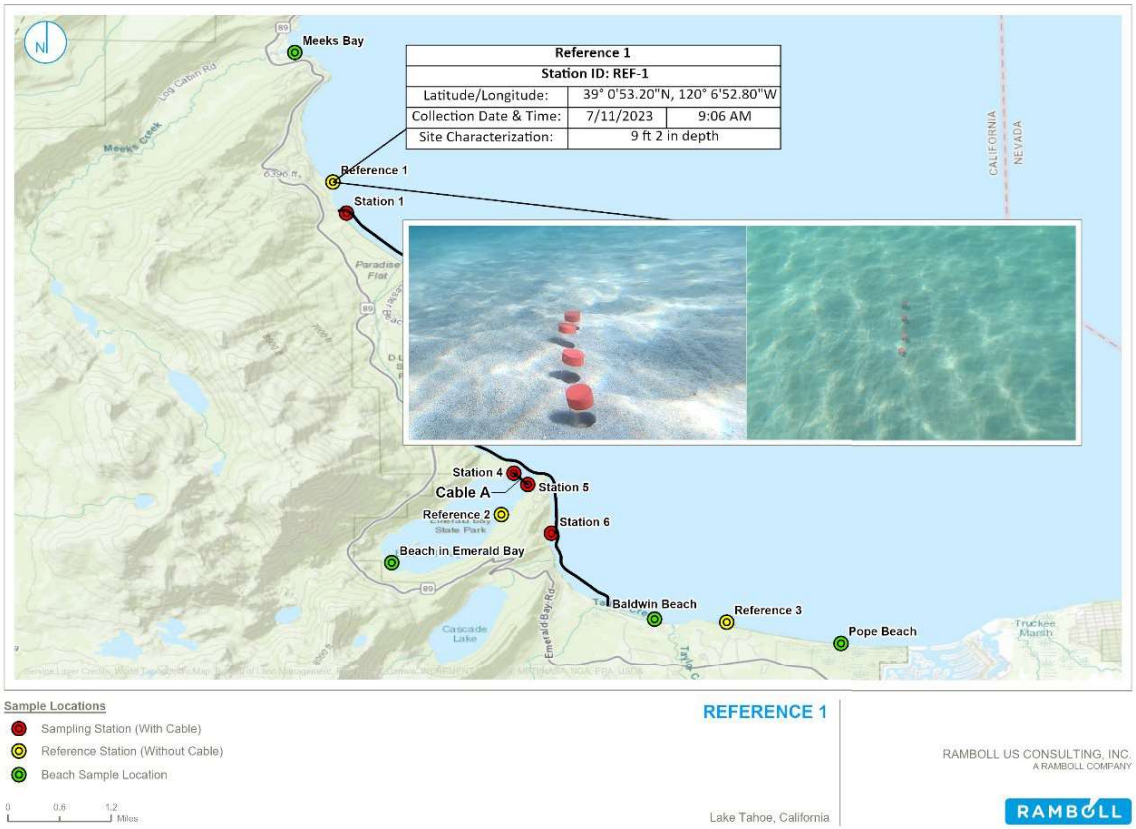


3.6 Reference 1 (REF1)

Sediments at Reference 1 were characterized as primarily featureless sand and located offshore of personal residences. Several personal boat docks were located within approximately 100 m of the site. Reference 1, which is more than one-half mile north of the apparent end of Cable B, is the same location used in the previous June 2023 water sampling event (Ramboll 2023). Water depth at REF1 was 9 feet 2 inches. A single analytical sample was collected at REF1. Figure 3-11 shows the visual reference for the sampling location while Figure 3-12 shows the sampling configuration and information.

Figure 3-11: Reference 1 Viewpoints

Figure 3-12: Reference 1 Location and Site Information

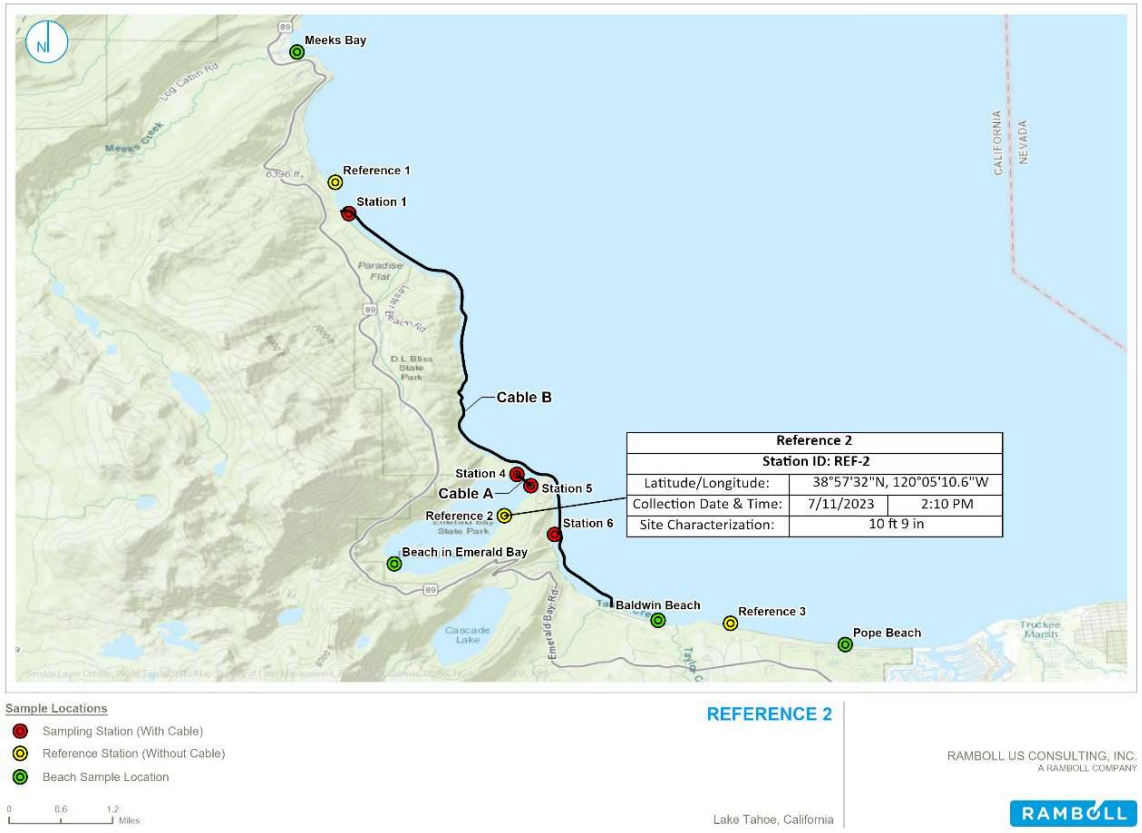


3.7 Reference 2 (REF2)

Reference 2 in Emerald Bay was characterized as hard sand over rocky substrate. Reference 2 is the same location used in the June water sampling event (Ramboll 2023). Sediment tube penetration was limited to 1 to 2 cm in depth. Therefore, multiple tubes were needed to collect sufficient sediment in this location. Water depth was 10 feet 9 inches, and a single set of sample tubes was collected. Figure 3-13 shows the visual reference for the location of REF2.

Figure 3-13: Reference 2 Viewpoints

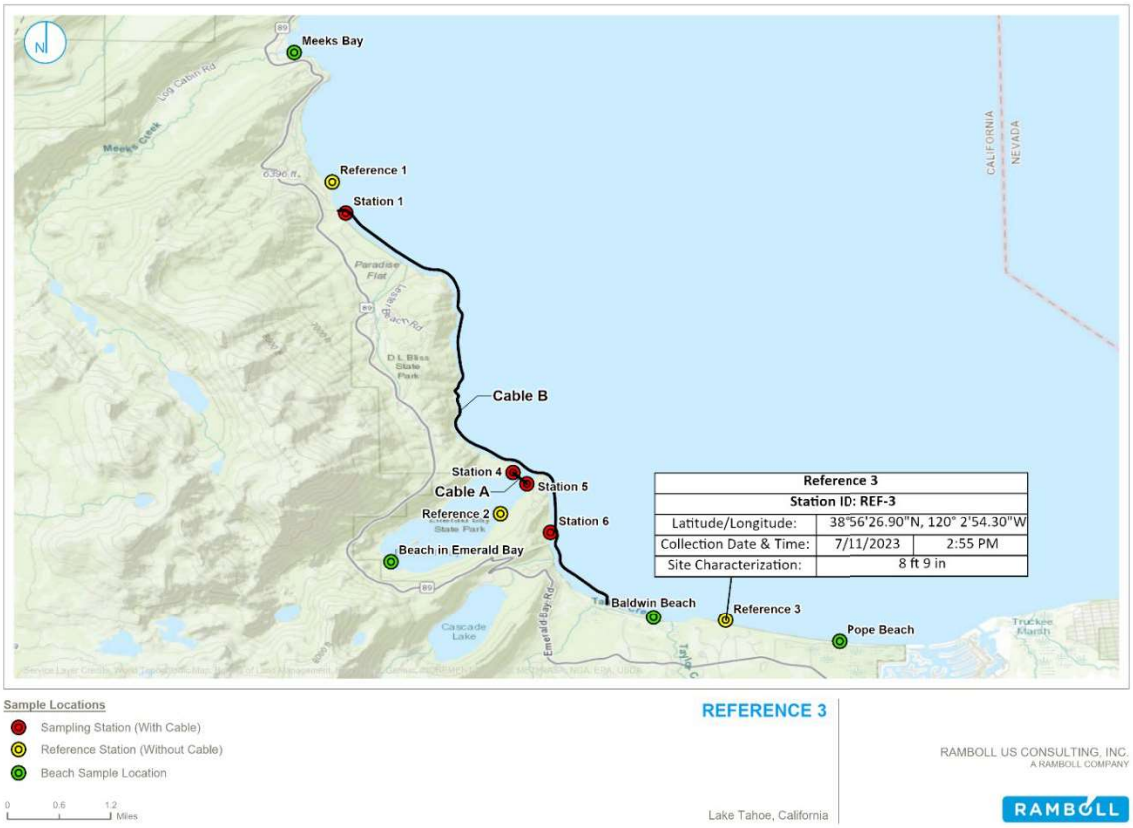
Figure 3-14: Reference 2 Location and Site Information



3.8 Reference 3 (REF3)

Reference 3 is located along the southern shoreline of the lake. It is the same location used for the previous water sampling reference station (Ramboll 2023). Reference 3 was characterized as sandy featureless substrate. Water depth was 8 feet 9 inches. A single set of sample tubes was collected. No photos were taken at this site.

Figure 3-15: Reference 3 Location and Site Information

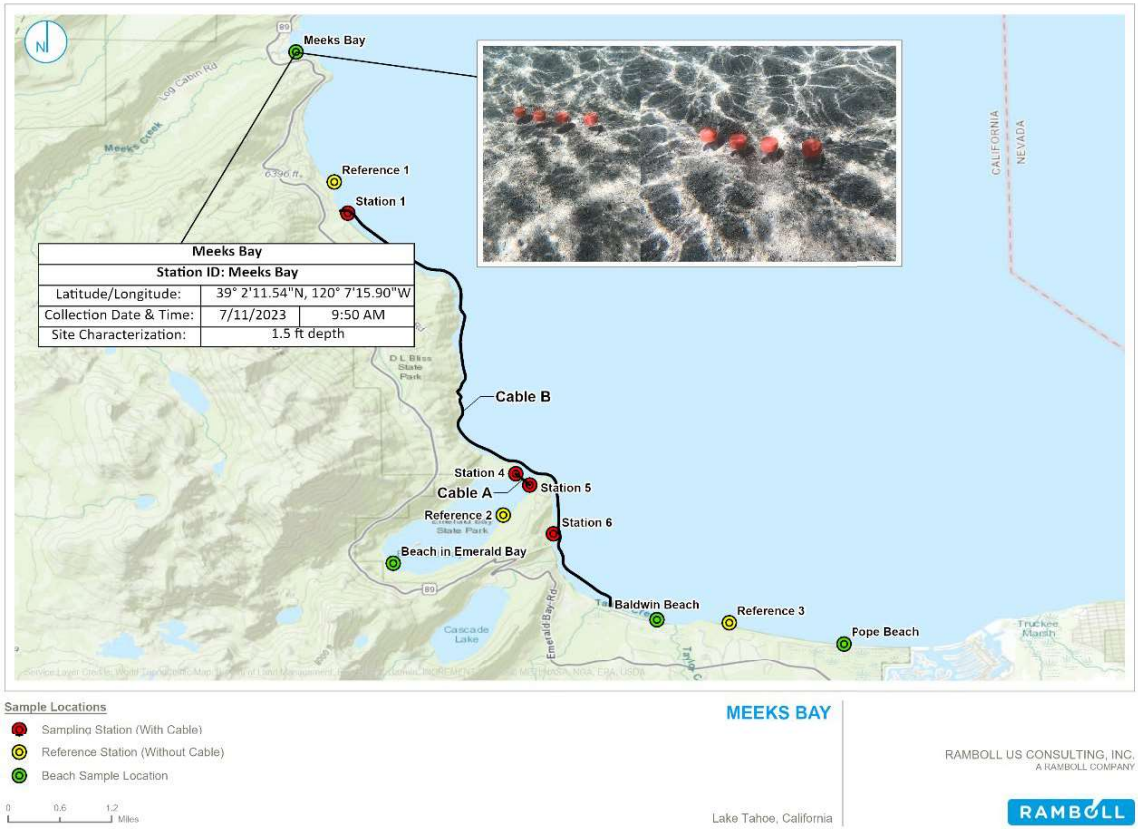


3.9 Meeks Bay Beach

Meeks Bay Beach is located on the northwestern shoreline of the lake. It is a public access beach with high volume of beach visitors. The beach is surrounded by a roped off area designated as a "no boat zone". To collect samples at this beach the sampling team swam in from the edge of the zone to the shallow bathing area. A single set of sample tubes was collected close to the shore in approximately depth of 1 foot 6 inches of water in the sandy substrate. Figure 3-16 shows the sampling configuration and location, while Figure 3-17 shows the sample location and site information.

Figure 3-16: Meeks Bay Beach Viewpoints

Figure 3-17: Meeks Bay Beach Location and Site Information



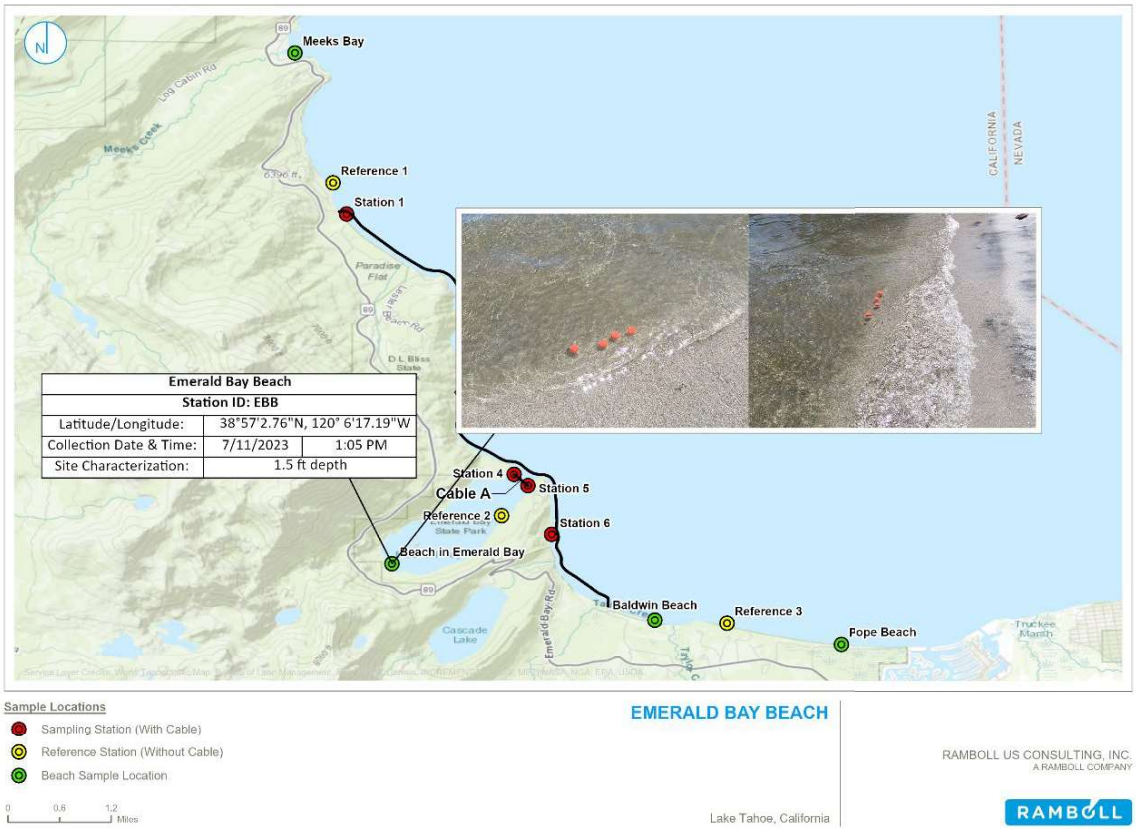
3.10 Emerald Bay Beach

Emerald Bay Beach is a highly utilized and heavily trafficked public beach in the back of Emerald Bay. During the time of sampling there were many beach visitors and boats parked along the beach area. The sampling team beached the vessel along a sand bar frequented by bathers approximately 25 m from the sampling location. A sample was collected in the shallow shoreline sand along a prominent sand bar. Water depth of the sample was approximately 1 foot 6 inches. Figure 3-18 shows the sample configuration and location detail, while Figure 3-19 shows the sampling information.

Figure 3-18: Emerald Bay Beach Viewpoints

Emerald Bay Beach - Viewpoint 1 | Emerald Bay Beach - Viewpoint 2 | Emerald Bay Beach - Viewpoint 3

Figure 3-19: Emerald Bay Beach Location and Site Information



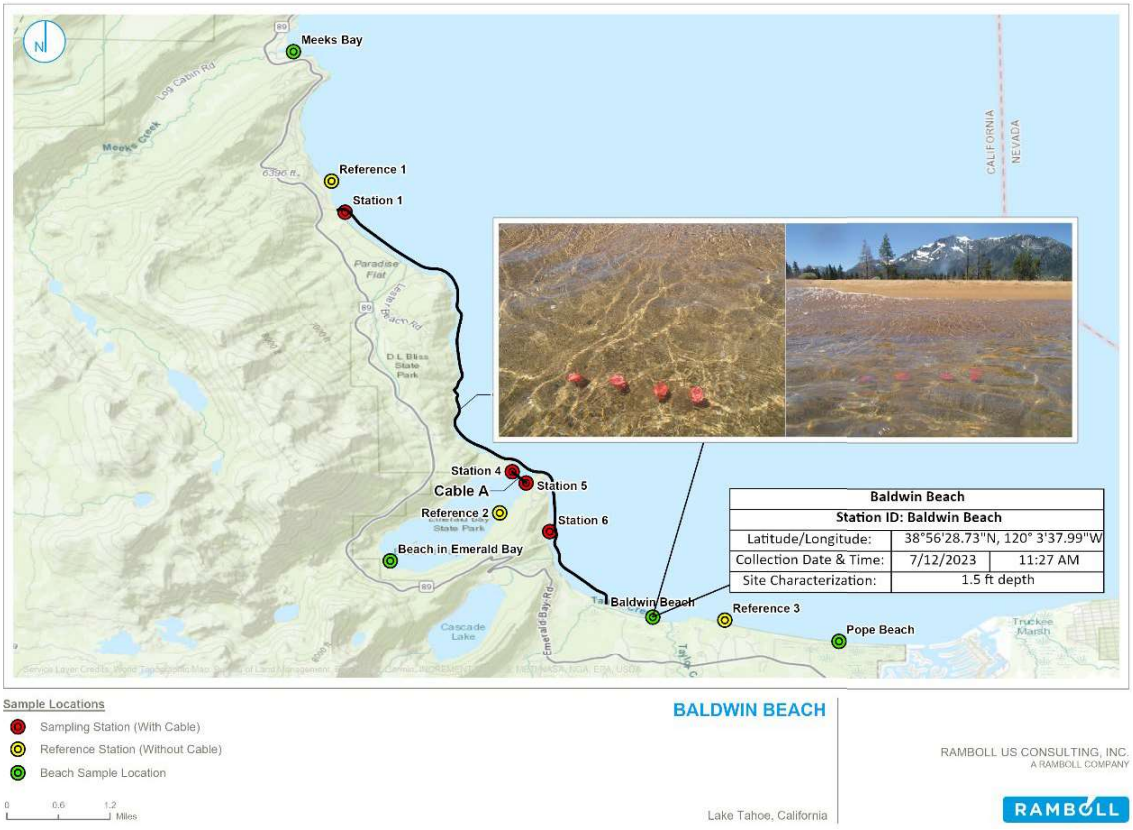
3.11 Baldwin Beach

Baldwin Beach is a public access area along the southern shore of the lake. It is characterized as an open sandy strand with public swimmers and several paddle boarders and kayakers. Little external boat activity was observed. The beach is posted with "no boat zone" signs so the sampling team were dropped off outside of the zone and swam into shore. Samples were collected along the beach in the wading and swimming area in approximately 1 foot 6 inches of water. Sediment was primarily sand. Figure 3-20 shows the sample configuration and location. Figure 3-21 shows the sample location and information.

Figure 3-20: Baldwin Beach Viewpoints

Baldwin Beach - Viewpoint 1 | Baldwin Beach - Viewpoint 2 | Baldwin Beach - Viewpoint 3

Figure 3-21: Baldwin Beach Location and Site Information



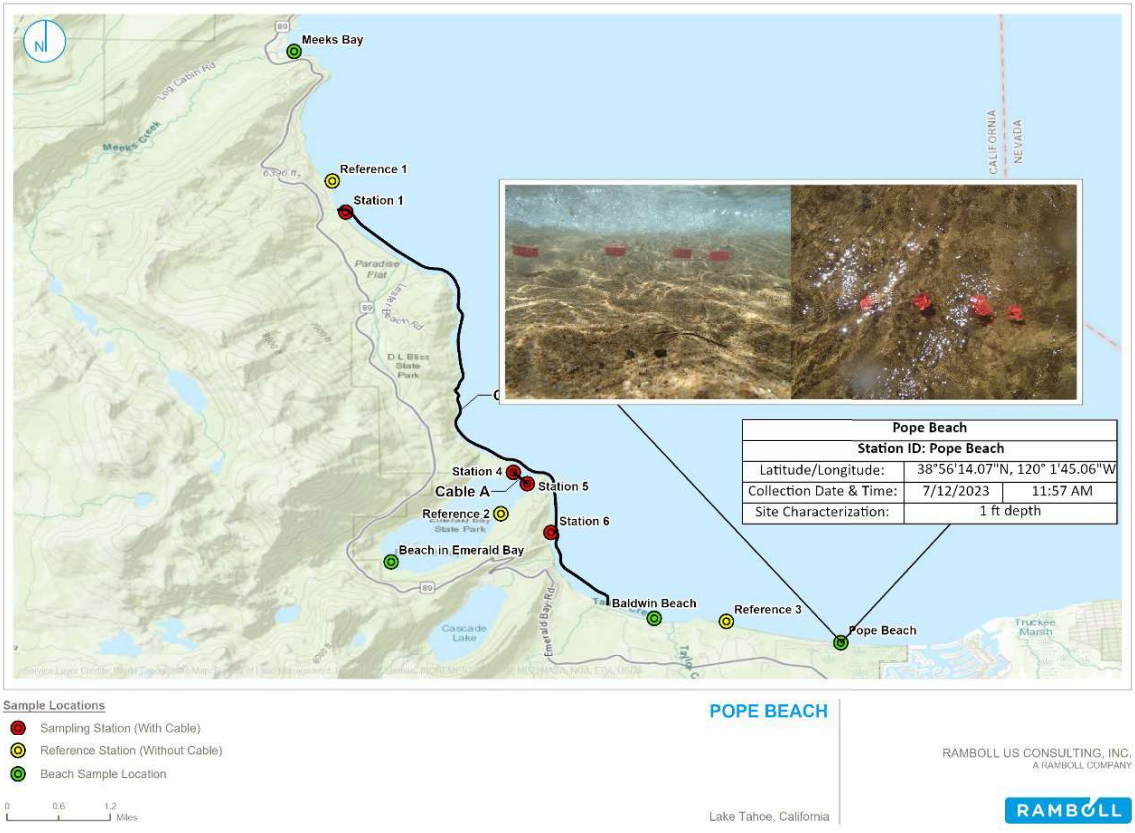
3.12 Pope Beach

Pope Beach is a public access beach along the southern lake shoreline. It is primarily accessed by visitors through a public camping and picnic ground area. This area is heavily utilized by swimmers and bathers and is located inside a "no boat zone". The lake bottom in this area is featureless sand. The sampling team approached the beach from the water and a single sample was collected from approximately 1 foot of water along the shoreline access area. Figure 3-22 shows the visual orientation of the sample location and Figure 3-23 shows the site location and information.

Figure 3-22: Pope Beach Viewpoints

Pope Beach - Viewpoint 1 | Pope Beach - Viewpoint 2 | Pope Beach - Viewpoint 3

Figure 3-23: Pope Beach Location and Site Information



4. RESULTS

Results for lead and physical parameters, and data validation of these results, are presented in this section. Results for other metals are not described here, but those data are included in Appendix A which includes all analytical results.

4.1 Lead Concentrations

Laboratory results for sediment lead concentrations, TOC and Total Solids are shown in Table 4-1. Lead concentrations at the cable stations ranged from 0.659 to 7.57 mg/Kg, while the lead concentration range at the reference stations was 0.549 to 2.45 mg/Kg. At the beach stations, the range was 0.920 to 1.40 mg/Kg. The highest lead concentrations were in the samples closest to the cable at SED4 and SED5-END, which are the ends of Cable A that had been cut with the outer steel protective wires bent back and the lead core exposed. Lead concentrations at SED4 directly below the cut and exposed cable averaged 5.435 mg/Kg while lead one meter away was 2.00 mg/Kg. Similarly lead under the cut end of Cable A at SED5-END was 5.57 mg/Kg and 1.77 mg/Kg one meter away (Table 4-1).

Average lead concentration at the samples closest to the cable ("A" samples) was 2.72 mg/Kg (SD=2.28). Average lead concentrations for the "B" (1 m) and "C" (2 m) samples were 1.39 mg/Kg (SD=0.43) and 1.11 (SD=0.36), respectively. Reference stations had average lead concentrations of 1.25 mg/Kg (SD=1.05), while beach stations within the wading/bathing zone had average lead concentrations of 1.22 mg/Kg (SD=0.22).

4.2 Physical Parameters

Grain size information from all sites showed that sediments collected in Lake Tahoe were predominantly sand and gravel with very low concentrations of fines (silt and clay). All samples including cable, reference, and beach areas had similar solids concentrations as expected from the grain size results. Average sand and gravel concentrations for all stations were: 94.8% (SED1); 93.2% (SED4); 97.7% (SED5); 98.2% (SED5-END); 95.5% (SED6); 98.1% (REF); and 96.6% (Beach). Total Solids ranged from 73.3% (SED4A) to 85.1% (SED4C). The TOC concentrations, for all stations were low indicating a high level of non-organic material such as rock or sand in all sediments. The TOC levels of all sediments ranged from an estimated value (i.e., "J-flagged") of 0.02% at Meeks Bay Beach to 0.22% at SED4. All TOC data indicate that very little organic material is found in the nearshore Lake Tahoe sediments at all stations.

4.3 Data Validation

After receiving the laboratory results, Ramboll performed data validation. Ramboll's data validation is based on guidance from the National Functional Guidelines for Inorganic Superfund Method Data Review (USEPA, 2020), the analytical method, laboratory specific quality assurance/quality control (QA/QC) criteria, and professional judgment. The QC information checked by Ramboll included chain-of-custody forms, holding times, reporting limits, blanks, laboratory control samples, matrix spike/matrix spike duplicate (MS/MSD) samples, field duplicates, laboratory duplicates, initial calibrations, internal standards, continuing calibration verification standards, serial dilution, and analyte identification and quantitation. Based on Ramboll's evaluation, the analytical data that were qualified (i.e., J-flagged) are valid and no data were rejected. This section summarizes the data qualifiers applied for lead and TOC as a result of the validation. The data qualifiers for other metals are reported in Appendix A.

Results were reported based on the laboratory method reporting limit (MRLs) adjusted for percent moisture and dilution factors. The MRL is the lowest concentration that can be reported with precision and accuracy. Results that were reported between the method detection limit (MDL) and MRL were flagged "J" as estimated by the laboratory. The MDL is the minimum measured concentration of a substance that can be reported with 99% confidence that the concentration is distinguishable from the method blank results. The "J" lab qualifiers were retained as data validation qualifiers for the results that were reported between the MDL and MRL.

No qualifiers were applied to the lead data. More than half of the TOC results were qualified "J" because the results between the MDL and MRL.

Table 4-1: Results for Sediment Sampling

Sample ID	Lead (mg/Kg)	Total Organic Carbon (%)	Total Solids (%)
SED1A-071123-C	**1.280**	0.06 J	**74.7**
SED1B-071123-C	**1.130**	0.05 J	**76.6**
SED1C-071123-C	**1.330**	0.05 J	**76.8**
SED4A-071123-C	**3.330**	**0.21**	**73.3**
SED4A-071123-C-FD*	**7.570**	**0.22**	**82.0**
SED4B-071123-C	**2.000**	**0.23**	**83.6**
SED4C-071123-C	**1.580**	0.07 J	**85.1**
SED5A-071223-C	**0.683**	**0.12**	**76.6**
SED5A-071223-C-FD*	**0.811**	**0.10**	**77.0**
SED5B-071223-C	**0.846**	**0.11**	**76.0**
SED5C-071223-C	**0.816**	0.09 J	**77.3**
SED5A-END-071223-C	**5.570**	**0.11**	**76.7**
SED5B-END-071223-C	**1.770**	0.07 J	**78.2**
SED6A-071223-C	**0.659**	**0.10**	**84.1**
SED6B-071223-C	**1.180**	0.09 J	**82.9**
SED6C-071223-C	**0.705**	**0.10**	**76.5**
REF1-071123-R	**0.750**	0.03 J	**74.6**
REF2-071123-R	**0.548**	0.08 J	**80.6**
REF3-071123-R	**2.450**	0.04 J	**77.5**
Meeks Bay-071123-MB	**1.400**	0.02 J	**84.0**
Emerald Bay Beach EBB-071123-B	**1.210**	0.03 J	**79.8**
Baldwin Beach-071223-B	**1.330**	0.03 J	**80.7**
Pope Beach-071223-B	**0.920**	0.06 J	**79.3**

Notes:
mg/Kg – milligrams per kilogram
J – reported as an estimated value
* – indicates field duplicate
Bold data indicates a measured value

5. DISCUSSION AND CONCLUSIONS

This field investigation found that lead concentrations were very low at all measured locations, including cable, reference, and beach stations. Slightly higher concentrations were found below the cut ends of the cable at SED4 (7.57 mg/Kg) and SED5-END (5.57 mg/Kg) where the lead sheath was exposed. All concentrations were well within or below the range of background levels of lead for freshwater sediments. National Oceanic and Atmospheric Administration (NOAA) (Buchman 2008) has published general toxicity reference levels for lead in freshwater sediments across the U.S. NOAA reported that "background" lead concentrations in freshwater sediments range from 4 to 17 mg/Kg. Furthermore, all lead concentrations found in this study were below published ecological toxicity thresholds (which range from 31 to 250 mg/Kg) indicating that they do not present an ecological risk to biota of Lake Tahoe (Buchman 2008).

The extremely low sediment lead concentrations are consistent with the low TOC and lack of fine-grained materials at these nearshore locations. Sediments at all stations were predominantly sand and gravel with extremely low concentrations of fine-grained materials (silt and clay). Organic carbon as determined by the TOC measurement was less than 0.22% at all stations, with many values below the laboratory reporting limit. Sediments with high sand and gravel content and low organic carbon would not be expected to retain metals due to the lack of organic rich fine materials where metals would bind.

These parameters explain why these nearshore sediment samples have lower lead concentrations than samples collected in deep sediments at the center of the lake which are expected to have smaller grain size and much higher TOC. Heyvaert et al. (2000) found an average of 11.7 mg/kg of lead in deep cores from lake sediments at 300- to 400-meter depths. These samples represent sediment concentrations prior to anthropogenic influences on lead concentrations.[2]

Lead concentrations are also higher in sediment of rivers feeding into Lake Tahoe. California's surface water monitoring program (https://data.ca.gov/dataset/surface-water-ambient-monitoring-program) collected eight samples from the Upper Truckee River, which is the largest tributary feeding into Lake Tahoe, from 2008 to 2020 and reported sediment concentrations averaging 13.1 mg/Kg, with a range of 11-16.1 mg/Kg. In four samples of fine-grained sediment (<63 microns) the concentrations averaged 17.8 mg/Kg with a range of 16-22.7 mg/Kg).

Overall, our data show that there is no release of lead in areas where the steel jackets covering the cables are intact and that even in the small sections at the end of the cables that were cut and have the lead sheath exposed, lead release to sediments is minimal. Furthermore, lead concentrations in sediment near the end of the cables are much lower than the lead concentrations measured in sediments in the lake's largest tributary. Lead concentrations in sediment at the cut cable ends are also well below ecological toxicity thresholds and do not pose an ecological risk.

Based on this study and our analysis of the sampling results, we conclude that lead found in Lake Tahoe sediments in the vicinity of the cables are indistinguishable from background and that the cables do not adversely influence lead concentrations in Lake Tahoe sediment.

[2] Sediment lead concentrations rose during the period when leaded gasoline was being used.

6. REFERENCES

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APPENDIX A
SEDIMENT ANALYTICAL RESULTS

A.1 Data Validation Results

Two field duplicate samples were collected (SED4A-071123-C and SED5A-071223-C). Precision for the field duplicate pairs was assessed by calculating the relative percent differences (RPD) for sample results that were detected greater than 5x the MRL in both the field sample and field duplicate. Precision of field duplicate results that were detected but less than 5x the MRL was assessed by comparing the absolute values. The field duplicate results were within 50% RPD or the absolute values were within 2x the MRL with the following exceptions:

- The RPD for potassium for the field duplicate pair collected at location SED5A-071223-C was 52%.
- The RPDs for Aluminum (98%), barium (123%), calcium (71%), chromium (58%), cobalt (110%), copper (95%), iron (89%), lead (78%), magnesium (121%), manganese (128%), nickel (90%), potassium (136%), vanadium (87%), and zinc (72%) exceeded 50% for the field duplicate pair collected at location SED4A-071123-C.
- The absolute difference for thallium was greater than 2x the MRL for the field duplicate pair collected at location SED4A-071123-C.

Results for metals which did not meet the precision goal for field duplicates were qualified "J" as estimated in the field sample and field duplicate.

The laboratory analyzed laboratory duplicates, matrix spike (MS) samples, and serial dilution samples prepared from samples SED1A-071123-C and SED6B-071223-C. The following data were qualified for laboratory duplicate, MS, and/or serial dilution nonconformances:

- The recoveries for magnesium and potassium exceeded the upper acceptance limit of 125% for the MS prepared from sample SED1A-071123-C. The post-spike recoveries were greater than 75%. Associated results for magnesium and potassium were qualified "J" as estimated.
- The recoveries for calcium, magnesium, and potassium were below the lower acceptance limit of 75% for the MS prepared from sample SED6B-071223-C. The post-spike recoveries were greater than 75%. Associated results for magnesium and potassium were qualified "J" as estimated.
- The RPDs for the laboratory duplicate prepared from sample SED6B-071223-C exceeded the laboratory acceptance limit of 20% for aluminum (47%), arsenic (96%), barium (104%), calcium (39%), chromium (38%), cobalt (39%), iron (42%), lead (52%), magnesium (60%), manganese (50%), nickel (46%), potassium (119%), sodium (30%), vanadium (48%), and zinc (63%). Associated results for these analytes were qualified "J" as estimated.

The percent differences for chromium and zinc exceeded 10% for the serial dilution prepared from sample SED1A-071123-C. Associated results for these analytes were qualified "J" as estimated.

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Sediment Analytical Results

Test Parameter	Analysis Method	Units	SED1-A	SED1-B	SED1-C	SED4-A	SED4-A-FD	SED4-B	SED4-C
Total Solids	SM 2540G	%	**74.7**	**76.6**	**76.8**	**73.3**	**82.0**	**83.6**	**85.1**
Total Organic Carbon	SM 9060	%	0.06 J	0.05 J	0.05 J	**0.21**	**0.22**	**0.23**	0.07 J
Grain Size (Sieve Size)									
Gravel, Medium (4.75 mm)	ASTM D422-M	%	0.00	0.00	0.00	8.25	2.36	17.28	9.17
Gravel, Fine (2.00 mm)	ASTM D422-M	%	0.00	0.00	0.00	25.06	16.71	23.70	13.19
Sand, Very Coarse (0.850 mm)	ASTM D422-M	%	5.03	3.71	6.41	21.02	22.39	20.68	13.98
Sand, Coarse (0.425 mm)	ASTM D422-M	%	47.30	40.36	44.18	14.83	18.23	13.60	22.23
Sand, Medium (0.250 mm)	ASTM D422-M	%	26.45	24.16	19.33	16.31	16.07	13.41	19.60
Sand, Fine (0.106 mm)	ASTM D422-M	%	19.54	25.09	20.96	12.25	9.58	8.03	11.28
Sand, Very Fine (0.075 mm)	ASTM D422-M	%	0.55	0.57	0.74	1.15	1.04	0.64	0.61
Silt	ASTM D422-M	%	0.06	0.82	1.93	2.20	1.88	0.61	0.14
Clay	ASTM D422-M	%	0.88	0.10	0.63	0.04	0.42	0.20	0.17
Total Weight Recovered	ASTM D422-M	%	99.81	94.81	94.18	101.11	88.68	98.15	90.37
Metals									
Aluminum	USEPA 6020B	mg/Kg	**2370**	**2470**	**2640**	**4930**	**1690**	**1160**	**1820**
Antimony	USEPA 6020B	mg/Kg	Not Detected	Not Detected	Not Detected	0.027 J	0.037 J	0.040 J	0.023 J
Arsenic	USEPA 6020B	mg/Kg	**2.07**	**2.13**	**2.34**	**3.98**	**3.67**	**3.30**	**4.28**
Barium	USEPA 6020B	mg/Kg	**20.3**	**21.3**	**22.4**	**50.9**	**12.1**	**10.6**	**14.6**
Beryllium	USEPA 6020B	mg/Kg	**0.063**	**0.059**	**0.068**	**0.035**	**0.020**	**0.021**	**0.022**
Cadmium	USEPA 6020B	mg/Kg	Not Detected	0.010 J	0.010 J	0.013 J	Not Detected	0.009 J	0.007 J
Calcium	USEPA 6020B	mg/Kg	**352**	**356**	**401**	**1520**	**727**	**581**	**776**
Chromium	USEPA 6020B	mg/Kg	**2.01**	**2.20**	**2.47**	**4.78**	**2.62**	**1.73**	**1.99**
Cobalt	USEPA 6020B	mg/Kg	**1.17**	**1.31**	**1.38**	**3.95**	**1.15**	**0.656**	**0.892**
Copper	USEPA 6020B	mg/Kg	**0.69**	**1.62**	**0.90**	**10.7**	**3.82**	**2.14**	**3.42**
Iron	USEPA 6020B	mg/Kg	**4340**	**4700**	**5060**	**11700**	**4500**	**3210**	**4300**
Lead	USEPA 6020B	mg/Kg	**1.28**	**1.13**	**1.33**	**3.33**	**7.57**	**2.00**	**1.58**
Magnesium	USEPA 6020B	mg/Kg	**1120**	**1210**	**1290**	**3140**	**778**	**396**	**685**
Manganese	USEPA 6020B	mg/Kg	**55.6**	**62.3**	**65.6**	**140**	**30.5**	**21.4**	**29.7**
Mercury	USEPA 7471B	mg/Kg	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
Nickel	USEPA 6020B	mg/Kg	**0.69**	**0.76**	**0.81**	**2.84**	**1.08**	**0.67**	**0.79**
Potassium	USEPA 6020B	mg/Kg	**1200**	**1270**	**1340**	**1630**	**308**	**179**	**298**
Selenium	USEPA 6020B	mg/Kg	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
Silver	USEPA 6020B	mg/Kg	0.006 J	0.005 J	0.007 J	0.011 J	0.005 J	0.008 J	0.005 J
Sodium	USEPA 6020B	mg/Kg	35 J	33 J	35 J	**119**	**78**	**65**	**90**
Thallium	USEPA 6020B	mg/Kg	**0.109**	**0.107**	**0.125**	**0.126**	**0.021**	0.011 J	0.013 J
Vanadium	USEPA 6020B	mg/Kg	**8.80**	**9.35**	**10.5**	**33.2**	**13.0**	**8.79**	**12.1**
Zinc	USEPA 6020B	mg/Kg	**12.2**	**13.0**	**14.3**	**20.1**	**9.41**	**6.20**	**7.96**

Notes:

mg/L – milligrams per liter

% = Percent

mm = milimeter

J – reported as an estimated value between the Method Reporting Limit (MRL) and the Method Detection Limit (MDL)

* – indicates field duplicate.

BOLD data indicates a measured value

Not Detected = Not detected at the Method Detection Limit (MDL)

Lake Tahoe Sediment Investigation 2023

Sediment Analytical Results

Test Parameter	Analysis Method	Units	SED5-A	SED5-A-FD	SED5-B	SED5-C	SED5-END-A	SED5-END-B	SED6-A	SED6-B	SED6-C
Total Solids	SM 2540G	%	**76.6**	**77.0**	**76.0**	**77.3**	**76.7**	**78.2**	**84.1**	**82.9**	**76.5**
Total Organic Carbon	SM 9060	%	**0.12**	**0.10**	**0.11**	0.09 J	**0.11**	0.07 J	**0.10**	0.09 J	**0.10**
Grain Size (Sieve Size)											
Gravel, Medium (4.75 mm)	ASTM D422-M	%	0.00	6.19	0.00	0.00	3.29	5.99	3.27	14.08	12.42
Gravel, Fine (2.00 mm)	ASTM D422-M	%	1.96	1.92	1.82	0.77	8.47	13.16	10.06	9.50	19.13
Sand, Very Coarse (0.850 mm)	ASTM D422-M	%	5.28	7.86	10.50	4.92	6.13	13.96	4.15	5.01	8.80
Sand, Coarse (0.425 mm)	ASTM D422-M	%	22.59	22.87	28.55	20.18	30.80	26.53	11.94	10.25	12.62
Sand, Medium (0.250 mm)	ASTM D422-M	%	35.36	32.71	31.46	32.54	39.15	28.32	36.02	29.39	27.35
Sand, Fine (0.106 mm)	ASTM D422-M	%	28.97	27.63	25.74	36.00	13.19	10.85	27.32	23.30	20.38
Sand, Very Fine (0.075 mm)	ASTM D422-M	%	0.63	0.56	0.58	0.74	0.35	0.24	1.16	1.01	0.89
Silt	ASTM D422-M	%	0.34	0.02	0.33	0.76	0.36	0.77	0.31	0.50	0.71
Clay	ASTM D422-M	%	0.09	0.33	0.25	0.00	0.00	0.44	0.12	0.00	0.20
Total Weight Recovered	ASTM D422-M	%	95.22	100.09	99.23	95.91	101.74	100.26	94.35	93.04	102.50
Metals											
Aluminum	USEPA 6020B	mg/Kg	**1470**	**1880**	**1560**	**1670**	**1900**	**1860**	**2250**	**5790**	**3010**
Antimony	USEPA 6020B	mg/Kg	0.039 J	Not Detected	0.042 J	0.030 J	0.029 J	Not Detected	0.024 J	0.038 J	0.030 J
Arsenic	USEPA 6020B	mg/Kg	**3.72**	**3.16**	**4.03**	**3.10**	**2.30**	**1.80**	**2.04**	**5.92**	**2.73**
Barium	USEPA 6020B	mg/Kg	**10.9**	**16.0**	**10.6**	**12.3**	**12.7**	**13.0**	**17.3**	**66.0**	**22.0**
Beryllium	USEPA 6020B	mg/Kg	**0.019**	0.023 J	0.019 J	**0.021**	**0.023**	**0.025**	**0.024**	**0.056**	**0.033**
Cadmium	USEPA 6020B	mg/Kg	0008 J	0.009 J	0.011 J	0.009 J	0.010 J	0.014 J	0.016 J	**0.027**	0.017 J
Calcium	USEPA 6020B	mg/Kg	**796**	**894**	**736**	**871**	**800**	**817**	**981**	**2590**	**1530**
Chromium	USEPA 6020B	mg/Kg	**3.24**	**3.03**	**2.65**	**2.98**	**3.32**	**3.00**	**5.73**	**7.26**	**4.69**
Cobalt	USEPA 6020B	mg/Kg	**0.823**	**1.17**	**0.794**	**0.874**	**1.18**	**1.12**	**1.71**	**3.27**	**2.18**
Copper	USEPA 6020B	mg/Kg	**2.49**	**2.89**	**2.57**	**2.74**	**5.58**	**4.12**	**5.73**	**8.95**	**11.2**
Iron	USEPA 6020B	mg/Kg	**3340**	**3670**	**3200**	**3290**	**4070**	**3400**	**6710**	**11200**	**6410**
Lead	USEPA 6020B	mg/Kg	**0.683**	**0.811**	**0.846**	**0.816**	**5.57**	**1.77**	**0.659**	**1.18**	**0.705**
Magnesium	USEPA 6020B	mg/Kg	**550**	**789**	**493**	**586**	**815**	**761**	**984**	**2020**	**1180**
Manganese	USEPA 6020B	mg/Kg	**20.6**	**27.7**	**20.7**	**21.0**	**28.3**	**25.3**	**33.5**	**52.3**	**30.9**
Mercury	USEPA 7471B	mg/Kg	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
Nickel	USEPA 6020B	mg/Kg	**0.91**	**1.09**	**0.82**	**0.92**	**1.35**	**1.24**	**1.59**	**3.05**	**2.15**
Potassium	USEPA 6020B	mg/Kg	**155**	**264**	**149**	**210**	**205**	**224**	**312**	**1150**	**298**
Selenium	USEPA 6020B	mg/Kg	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
Silver	USEPA 6020B	mg/Kg	0.005 J	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	0.004 J	0.010 J	0.008 J
Sodium	USEPA 6020B	mg/Kg	**114**	**116**	**113**	**119**	**103**	**103**	**110**	**333**	**171**
Thallium	USEPA 6020B	mg/Kg	0.009 J	0.014 J	0.008 J	0.012 J	0.010 J	0.015 J	0.015 J	**0.047**	**0.025**
Vanadium	USEPA 6020B	mg/Kg	**10.9**	**11.5**	**9.77**	**12.4**	**12.1**	**10.9**	**24.0**	**38.1**	**21.9**
Zinc	USEPA 6020B	mg/Kg	**6.68**	**8.74**	**6.96**	**7.24**	**15.3**	**8.21**	**10.8**	**20.5**	**11.2**

Notes:

mg/L – milligrams per liter

% = Percent

mm = milimeter

J – reported as an estimated value between the Method Reporting Limit (MRL) and the Method Detection Limit (MDL)

* – indicates field duplicate.

BOLD data indicates a measured value

Not Detected = Not detected at the Method Detection Limit (MDL)

Lake Tahoe Sediment Investigation 2023

Sediment Analytical Results

Test Parameter	Analysis Method	Units	REF1	REF2	REF3	Meeks Bch	EB Beach	Baldwin Bch	Pope Bch
Total Solids	SM 2540G	%	**74.6**	**80.6**	**77.5**	**84.0**	**79.8**	**80.7**	**79.3**
Total Organic Carbon	SM 9060	%	0.03 J	0.08 J	0.04 J	0.02 J	0.03 J	0.03 J	0.06 J
Grain Size (Sieve Size)									
Gravel, Medium (4.75 mm)	ASTM D422-M	%	0.00	8.63	0.00	5.75	10.09	0.00	0.00
Gravel, Fine (2.00 mm)	ASTM D422-M	%	0.33	26.65	0.00	16.41	25.60	13.13	2.91
Sand, Very Coarse (0.850 mm)	ASTM D422-M	%	12.09	20.75	3.14	34.00	20.65	56.85	42.55
Sand, Coarse (0.425 mm)	ASTM D422-M	%	51.60	22.52	51.96	28.61	21.39	28.98	49.27
Sand, Medium (0.250 mm)	ASTM D422-M	%	21.87	13.39	17.41	9.84	11.21	0.44	1.97
Sand, Fine (0.106 mm)	ASTM D422-M	%	13.93	5.28	22.96	1.46	4.10	0.13	0.56
Sand, Very Fine (0.075 mm)	ASTM D422-M	%	0.45	0.42	1.04	0.02	0.38	0.02	0.07
Silt	ASTM D422-M	%	0.64	0.32	0.30	0.02	0.68	0.03	0.00
Clay	ASTM D422-M	%	0.04	0.02	0.51	0.17	0.20	0.44	0.21
Total Weight Recovered	ASTM D422-M	%	100.95	97.98	97.32	96.28	94.30	100.02	97.54
Metals									
Aluminum	USEPA 6020B	mg/Kg	**1270**	**1770**	**861**	**1350**	**2450**	**1080**	**893**
Antimony	USEPA 6020B	mg/Kg	Not Detected	0.024 J	0.028 J	Not Detected	**0.074**	0.029 J	0.024 J
Arsenic	USEPA 6020B	mg/Kg	**0.87**	**3.11**	**6.96**	**1.62**	**0.64**	**10.8**	**6.20**
Barium	USEPA 6020B	mg/Kg	**12.5**	**14.1**	**6.26**	**25.2**	**72.6**	**83.3**	**7.56**
Beryllium	USEPA 6020B	mg/Kg	**0.027**	0.021 J	**0.028**	0.022 J	**0.029**	**0.039**	**0.036**
Cadmium	USEPA 6020B	mg/Kg	Not Detected	0.009 J	0.018 J	0.021 J	Not Detected	**0.022**	0.013 J
Calcium	USEPA 6020B	mg/Kg	**268**	**1280**	**502**	**545**	**791**	**389**	**360**
Chromium	USEPA 6020B	mg/Kg	**1.13**	**4.07**	**1.98**	**1.07**	**2.15**	**1.09**	**1.17**
Cobalt	USEPA 6020B	mg/Kg	**0.569**	**6.22**	**0.416**	**0.576**	**1.63**	**0.432**	**0.403**
Copper	USEPA 6020B	mg/Kg	**0.52**	**4.67**	**0.78**	**0.53**	**3.91**	**0.828**	**0.95**
Iron	USEPA 6020B	mg/Kg	**2220**	**4390**	**3690**	**2330**	**4220**	**4510**	**3980**
Lead	USEPA 6020B	mg/Kg	**0.750**	**0.548**	**2.45**	**1.40**	**1.21**	**1.33**	**0.920**
Magnesium	USEPA 6020B	mg/Kg	**528**	**783**	**145**	**545**	**1330**	**140**	**152**
Manganese	USEPA 6020B	mg/Kg	**26.2**	**28.6**	**14.4**	**33.0**	**59.6**	**284**	**14.3**
Mercury	USEPA 7471B	mg/Kg	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
Nickel	USEPA 6020B	mg/Kg	**0.39**	**1.25**	**0.35**	**0.41**	**1.40**	**0.42**	**0.44**
Potassium	USEPA 6020B	mg/Kg	**514**	**198**	**92**	**547**	**983**	**100**	**90**
Selenium	USEPA 6020B	mg/Kg	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
Silver	USEPA 6020B	mg/Kg	Not Detected	Not Detected	Not Detected	0.007 J	Not Detected	Not Detected	Not Detected
Sodium	USEPA 6020B	mg/Kg	30 J	**106**	46 J	**80**	**55**	**45**	35 J
Thallium	USEPA 6020B	mg/Kg	**0.043**	0.006 J	Not Detected	**0.036**	**0.096**	0.004 J	0.066 J
Vanadium	USEPA 6020B	mg/Kg	**4.63**	**14.1**	**9.59**	**5.39**	**11.3**	**8.85**	**8.82**
Zinc	USEPA 6020B	mg/Kg	**6.21**	**6.72**	**4.86**	**7.41**	**9.92**	**3.82**	**4.79**

Notes:

mg/L – milligrams per liter

% = Percent

mm = milimeter

J – reported as an estimated value between the Method Reporting Limit (MRL) and the Method Detection Limit (MDL)

* – indicates field duplicate.

BOLD data indicates a measured value

Not Detected = Not detected at the Method Detection Limit (MDL)

APPENDIX B
SAMPLING TEAM RESUMES

RAMBOLL

ENVIRONMENT & HEALTH

PAUL R. KRAUSE, PHD

Principal

Dr. Krause has over 30 years of experience in marine and aquatic ecology, toxicology, environmental impact analysis, environmental risk assessment, modeling, and regulatory permitting and negotiation. He is an internationally recognized expert in international permitting projects. His academic specialty is in marine ecology specializing in issues relating to the effects of large-scale industrial developments worldwide. His particular expertise revolves around development of multi-disciplinary teams for the management of large programs focused on marine and coastal environments. This includes development of port facilities, international impact assessments, designing and managing restoration projects (kelp forest and rocky reefs, corals, mangroves, and wetlands), emergency responses, decommissioning strategies, permitting, environmental studies, compliance, and agency negotiations. Dr. Krause has managed large impact and ecological assessments of marine and terrestrial receptors throughout the western United States, Gulf of Mexico, the Pacific Islands, Caribbean, Thailand, Malaysia, Brunei, Indonesia Australia, and West Africa.

EDUCATION

PhD, Ecology/ University of California, Santa Barbara, CA, 1993.

MS, Biological Sciences, California State University, Long Beach, CA, 1987.

BS, Marine Biology, California State University, Long Beach, CA, 1984.

PROFESSIONAL AFFILIATIONS AND REGISTRATIONS

- Certified Professional Ecologist – Ecological Society of America, 2006-present
- International Association of Impact Analysis
- Society of Environmental Toxicology and Chemistry (National and SoCal Chapters)
- Society of Petroleum Engineers
- Journal of Experimental Ecology and Marine Biology–Editorial Board
- Archives of Environmental Contamination and Toxicology–Editorial Board

FIELDS OF COMPETENCE

- Marine ecology: temperate, tropical and wetlands
- Ecotoxicology
- Sediment toxicology

CONTACT INFORMATION

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United States of America

- Natural Resource Damage Assessment (NRDA)
- Ecological risk assessment
- NEPA, CEQA and ESHIA studies
- Contaminated site investigations
- Oil spill response and cleanup

COURSES TAUGHT

- Ecosystems Management and Conservation (team) – Rice University
- Environmental Toxicology; and Bioassay Methods – San Francisco State University
- Aquatic Ecology; Functional Design in Fishes; and Systematics of Fishes – University of California Santa Barbara
- Tropical Ecology – California State University Long Beach
- Field-Bases Exposure and Effects Measurements – SETAC Short Course
- Using Data Quality Objectives to Optimize Data Collection – SETAC Short Course
- Confounding Factors in Sediment Toxicology – SETAC Short Course

KEY PROJECTS

LITIGATION AND SUPPORT SERVICES

Pipeline Spill, Litigation Expert
Supported litigation efforts related to a pipeline spill in southern California. This included evaluation of data related to ship collisions, pipeline ecological communities, organism growth and survival at offshore locations. Results of studies informed counsel to the nature and extent of direct impacts associated with anchor hits to the pipeline.

Streambed Ecology, Litigation Expert
Evaluated streambed ecological impacts related to potable water release in high mountain stream in Vail, Colorado. This included review of plaintiff expert reports, evaluation of data, investigation to the potential toxicological impacts of the release. Developed a technical report for defense counsel and participated in agency negotiations on settlement.

Offshore Decommissioning, Litigation Expert
Served as defense expert in evaluating contractual obligations, state of the science, and regulatory history for platform decommissioning obligations in the Santa Barbara Channel. Reviewed technical and regulatory documents, formulated opinion, and provided technical advice to counsel.

NPDES Discharges, Litigation Expert
Supported NPDES litigation related to permit conditions for discharges at several large municipal wastewater sites. Issues included bacteriological, toxicological, and nutrient aspects of promulgated NPDES permits issues by the State.

Sediment Quality Objectives, Principal Toxicologist
Evaluated and developed the proposed framework for establishing sediment quality objectives for the State of California. Participated as a member of the Scientific Advisory Committee and evaluation of proposed methods for the evaluation and implementation of objectives to determine direct and indirect effects of contaminated sediments on ecological receptors.

Project Toxicologist/Lead Stakeholder Outreach Scientist
Developed the California Toxic Hot Spot review and sediment quality criteria. Provided direct support as liaison to SWRCB throughout the process. Served as member of the Scientific Steering Committee.

Project Manager/Senior Ecologist
Served as a litigation expert for stream and bay communities contamination from chromium, PCB, and fluoride contamination from groundwater sources. Project involved development of field studies,

interpretation of past studies, review and analysis of benthic ecological data, development of litigation support materials, and trial demonstrable materials.

Principal Toxicologist
Provided litigation support services, project management, and strategic consulting. This project supported an imminent and substantial endangerment claim brought against the client. Managed trial depositions of experts, review of plaintiff's expert reports, development of defense expert reports, and publication of trial demonstratives.

Principal Toxicologist
Supported pending litigation regarding a TMDL related to a drinking water reservoir. Activities included the design of proposed field studies, review of regulations, regulatory negotiations, and strategic consulting.

Risk Assessor/Project Manager
In preparation for a property transfer, conducted the Ecological Risk Assessment on effects of residual PCBs and metals on the terrestrial and marine communities in Humboldt Bay, CA.

Risk Assessor/Project Manager
Conducted the Ecological Risk Assessment on effects of mine tailings on a stream community at the Cornucopia mine site in eastern Oregon.

Project Toxicologist/Project Manager
Provided regulatory support, sediment study plans, field and laboratory services, and risk assessment assistance for routine maintenance dredging and development activities.

NATURAL RESOURCES DAMAGE ASSESSMENT/RESTORATION

Partner in Charge/Principal Ecologist
Developed wetland restoration plan for the Carpinteria Salt Marsh. This project was a compensation effort related to offshore impacts associated with decommissioning. Developed the design of the restoration of a 45 acre marsh including channel development, lagoon and water outlet, plant communities, and avian resources.

Partner in Charge/Principal Ecologist
Developed wetland restoration efforts for the Port of Sonoma. This included development of sediment restoration and remediation, vessel navigation areas, and channel design. The 95 acre wetland was a restoration of previous salt hay agriculture that lasted for over 50 years. The original wetland suffered significant sediment loss during the agriculture areas. Final restoration and removal of levees resulted in tidal connectivity and establishment of a natural wetland community.

Principal Ecologist
Developed specific wetland restoration effort on the Cargill Salt Ponds in San Francisco Bay. This multi-year project was designed to restore natural wetlands to previous ponded areas used for salt production in the South Bay area. Provided ecological support, development and stakeholder outreach.

Partner in Charge/Principal Ecologist
Led a team of experts to support damage assessment of an oil spill in Peru following the Tonga volcanic explosion. This included reviewing response assessments, environmental damages, and ecological impacts. Worked with the client to develop remedial action plans for assessment and discharge monitoring.

Partner in Charge/Principal Ecologist
Retained expert in the assessment of streambed impacts from a water release to high mountain stream community. Assessment included review of habitat equivalency assessment, impacts to fishes and

benthic communities and evaluation of Trustee methods and assessments. Supported negotiations of final settlement.

Partner in Charge/Principal Ecologist
Retained expert for development of damage assessment in relation to a pipeline leak in Southern California. This included an evaluation of damage causes, spatial and temporal assessment of marine communities and impacts associated with anchor strikes.

Partner in Charge/Principal Ecologist
Provided expert support for a transfer pipeline spill of crude at a shipping terminal in San Francisco Bay. This included developing sediment and water sampling for environmental forensics (fingerprinting) of the source and spilled oil. Primary support with Trustee agencies for NRDA discussions.

Partner in Charge/Principal Ecologist
Developed spill response including sediment, biota, and water sampling efforts following a ship grounding on a coral reef in Mauritius. Developed a rapid response team under COVID-19 protocols to provide the responsible party with detailed daily updates, spill modeling, and recovery plans.

Partner in Charge/Principal Ecologist
Managed a diverse team of scientists to support the NRDA efforts around a pipeline spill in Santa Barbara, California. This included working with the client to support Technical Working Groups focused on marine impacts. Developed multiple restoration efforts in support of damage offsets including subtidal reef developments.

Partner in Charge/Principal Ecologist
Supported client-led efforts for NRDA settlement related to a pipeline spill. This included initial surveys of affected biota and development of appropriate and relevant restoration efforts.

Partner in Charge/Principal Restoration Ecologist
Provided expert support on coral recovery and restoration activities relative to the MS252 spill in the Gulf of Mexico. Duties included review of design proposal for both shallow and deepwater corals. Retained expert on deepwater coral recovery and biology as well as focus on development of coral recovery projects.

Principal Marine Ecologist
Developed coral restoration activities in relation to on-going oil and gas activities in Asia. This included development of restoration alternatives, implementation of artificial reef development and design of on–going monitoring efforts.

Principal Marine Ecologist
Developed mangrove restoration plan following a drilling fluid release in Southeast Mexico. This included restoration of areas of endangered black mangrove. Following fluid cleanup, ecological risk and restoration potential was evaluated and plantings started. Local NGO groups took over the ongoing monitoring and maintenance of the restoration site in conjunction with local regulatory authorities.

Partner in Charge/Principal Ecologist
Developed a key team of scientists to develop specific NRDA training modules for Marathon staff. Conducted on-site training for NRDA, SCAT, and other spill assessment efforts.

Partner in Charge/Principal Ecologist
Developed carbon sequestration model for wetlands as part of a restoration project in Santa Barbara County, California. This model provided the client with an estimate of potential carbon sequestration (in CO2 equivalents) used to offset project emissions. The model is applicable to wetlands across a wide range of geographies and conditions.

Principal Ecologist
Developed a wetlands restoration project in conjunction with the public handover of salt ponds used for salt recovery in San Francisco Bay. This ProJet included evaluations of sediment and water quality

conditions in pre- and post-restoration areas relative to ecological needs for receptors of concern in the region.

Partner in Charge/Principal Ecologist
Developed a working model to predict carbon sequestration potential from grasslands. The focus of this project was to identify and quantify carbon sequestration (in CO_2 equivalents) on prairie and grassland ecosystems in conjunction with oil and gas well pad decommissioning. Following decommissioning the well pad areas were designed to be restored to native grasslands. The model has applicability for grasslands in a wide geographic range. Building upon existing published models, the outcome of this study produced a working model to be utilized by restoration groups and clients.

TOXICOLOGY AND DISCHARGE RELATED STUDIES

Principal Toxicologist
Evaluated the functional toxicological relationship between acid discharges from a mining site in the central Sierra Nevada Mountains. Discharges released from the mine to the Feather River included mercury and copper discharges with particular effects on salmonids.

Project Principal
Managed toxicological investigation from accidental spill on the upper Feather River following a trucking accident that resulted in discharges of pesticide to the river.

Project Principal
Supported operations at the Leviathan Mine in Northern California. This included health and safety operations, toxicological support for discharges to local streams, and diesel spill cleanup.

Project Director
Designed and managed NPDES studies including permit negotiations for a large group of dischargers to San Francisco Bay. This program for over 15 dischargers included TIE studies to determine causative agents in effluent toxicity and served to bolster negotiations for renewal of NPDES permits.

Project Director
Designed and managed laboratory studies for storm water dischargers in the San Francisco Bay area and Central Valley to determine chlorinated pesticide loadings for permit negotiations. Study included a series of TIE studies to track storm water toxicity and its related causative agents. Specific studies were performed to determine toxicity thresholds using a variety of agricultural pesticides and herbicides.

Project Director
Managed routine discharge permit toxicity testing and evaluations for up to 25 dischargers using a variety of freshwater and marine organism pursuant to individual NPDES permits.

Project Director
Served as the principal investigator and senior toxicologist for a multi-phase TIE study for the City of Santa Cruz in accordance with a California consent order. Results of the study were used to evaluate and rectify engineering changes within the POTW system to meet NPDES discharge standards.

Principal Investigator
Analyzed spatial and temporal distributions of toxicity around a municipal-industrial wastewater discharge in Corpus Christi Bay, TX. Designed and led field and laboratory studies to characterize waste plumes using sediment pore-water toxicity, water chemistry, and benthic diversity data.

Principal Investigator
Served as principal investigator in an analysis of the ecological effects of oil-related effluents. Designed and led both field and laboratory studies to investigate effects on reproduction, growth, and development of marine invertebrates from produced water discharges in southern California.

Environmental Specialist
Projects involved lake management, water quality biology, hydrographic monitoring, and chemical analysis.

IMPACT ASSESSMENT SERVICES

Partner in Charge/Principal Ecologist
Managed the international Impact Assessment for the development of a deepwater oil and gas facility offshore Angola. This included the establishment of environmental baseline, impact analysis, all documentation, and development of regulatory support process through the license to install phase for both the facility and associated seafloor pipeline.

Project Principal/Marine Ecologist
Developed a detailed review of deepwater methane hydrates that included search and review of existing peer-reviewed literature as well as agency and industry publications related to formation and hydrate properties, toxicology, and ecological impacts.

Project Principal/Marine Ecologist
Developed and led ecological evaluations of offshore resources of Angola including sediment, biota and water quality. Developed ecological resource valuations, fisheries, project alternatives, restoration potential, and current status evaluations throughout the region.

Technical Marine Lead
Provided technical input to the study design and field effort for developing the biological baseline of a deepwater exploration field. Field samples included deepwater drop cameras, water and sediment quality, and benthic resources. Specific emphasis was placed on the evaluation of the presence of chemosynthetic communities. Samples were collected at depth of over 900 m at over 17 station locations in a regional background approach.

Project Principal/Marine Ecologist
Conducted a detailed literature search and review of the effects of dispersants used in oil spill response. This culminated in a detailed review document for Chevron's internal use in developing spill response strategy.

Project Principal Toxicologist
Provided professional ecological risk assessment support for understanding risk issues at the Questa Mine. Provided oversight of field biological teams in sampling and analysis, data review, and ecological risk assessment particularly for metals toxicology related to terrestrial reptiles, mammals, and aquatic resources.

Project Principal/Senior Marine Ecologist
Assisted in scoping and project development for deep water fisheries studies in the deep offshore waters of the Nigerian coastline. Developed a sampling scope of work to determine fishery resources that included demersal/benthic, pelagic, and marine mammals. Data will be used by the client and the local government agencies to develop long-term fishery management strategies.

Principal Marine Ecologist
Provided expert evaluation of the feasibility of developing offshore mariculture facilities for the culture of large marketable species such as California halibut, rockfishes, yellowtail, and striped bass. Culture facilities were designed to be deployed onto existing offshore oil platforms as grow-out facilities in conjunction with Hubbs Sea World.

Project Principal Marine Ecologist
Managed marine resources and development of components of drilling plan for resources in Alaska's Chukchi Sea. Studies included impacts of ice scour, marine noise, and drilling activities on marine mammals (cetations and pinepeds), marine fishes, and terrestrial mammals (polar bears).

Principal
Developed complex project application package under CEQA for the citing and permitting of an offshore Liquefied Natural Gas (LNG) terminal in the Santa Barbara Channel. Project tasks included detailed plume modeling, terminal NPDES permit applications, and the permitting of a 45 mile LNG pipeline through the southern California Mountains.

Project Principal/Senior Ecologist
Principal investigator and program manager for development of necessary permits under CEQA for the removal of over six miles of abandoned pipelines. Pipelines ran across sensitive habitats along the Santa Barbara bluffs. Developed effective stakeholder advocacy plans with agencies such as CCC, CSLC, and City of Goleta. Additionally, supported engineering estimates for the development of innovative approaches to the removal of the pipeline with minimal impacts. Developed HSSE, Fire Control, permit monitoring, and demolition teams.

Project Principal/Senior Scientist
Managed a team to develop drilling permits and application packages for the first on-shore drilling project within Los Angeles County in over 25 years. This project involved development of permit packages and evaluation of impacts to local ecology, resident communities, and the public.

Principal Marine Ecologist
Developed and led the evaluation of marine impacts related to the largest 3D seismic survey to be conducted in California under CEQA. The resultant EIA included impacts to nearshore fish and invertebrate populations, marine mammals, and marine habitats extending across central California.
Principal Marine Ecologist
Developed and led the marine impact assessment ESHIA team and served as the primary subject matter expert for the determination of impacts related to marine port development facilities in southwestern Alaska. Impacts evaluated included marine threatened and endangered species, fish and invertebrate communities, and marine habitats.

Senior Review
Provided expert review of project deliverables related to the potential effects of mine tailing sediments on fluvial stream resources including fish and invertebrate resources at the Pebble Mine in Bristol Bay, AK.

Project Principal/Senior Scientist
Developed and managed scientific services for the decommissioning of a relic oil pier. This included development of permits and monitoring plans for the threatened and endangered species, de-construction activities monitoring, and development of a long-term ecological study of the newly created artificial reef. This project involves CEQA reporting, subtidal monitoring activities and reporting.

SEDIMENT INVESTIGATIONS

Partner/Principal Toxicologist
Worked on a large-scale lake remediation project. Tasks included development of sampling and analysis plans, negotiations with key Federal and State agencies, field supervision, and data analysis/reporting.

Principal Toxicologist
Collected and analyzed sediment data related to remediation at the U.S. Naval Base at Coronado, California. This included development of a detailed ecological risk assessment, and negotiations with State agencies and the U.S. Navy.

Gulf of Thailand, Project Principal/Marine Ecologist
Developed and led ecological evaluations of offshore resources including sediment, biota, and water quality. Developed ecological resource valuations, fisheries, project alternatives, restoration potential, and current status evaluations throughout the region.

Project Manager/Toxicologist
Provided senior level management for the development of the site characterization and risk assessments associated with an Early Action under CERCLA for the Port of Portland. Led field sampling,

laboratory quality assurance, project management, and reporting through the Engineering Estimate/Cost Analysis (EE/CA) report. Superfund Site, Puget Sound, WA.

Chemical Quality Control Officer/Toxicologist
Developed a comprehensive monitoring program. Provided quality control oversight and reporting for the placement of dredged material at the PSR site. Developed Sampling and Analysis Plans and Quality Assurance Project Plans, negotiated with regulators, and performed water quality modeling.

OIL AND GAS DECOMMISSIONING

Partner in Charge/Principal Toxicologist
Developed decommissioning strategy around plastic and flexible flow lines and umbilicals around leave in place options for deepwater production sites. This included detailed literature reviews, plastic degradation studies and toxicological reviews.

Project Manager/Senior Marine Ecologist
Developed a decommissioning plan and environmental impact assessment for marine fish populations related to the closure and dismantlement of offshore oil production and transportation facilities in the Islamic Republic of Mauritania. Developed initial environmental impacts associated with deepwater decommissioning and leave-in-place options for subsea structures, lines, and associated infrastructure.

Partner in Charge/Principal Ecologist
Developed a decommissioning strategy plan for offshore and onshore decommissioning of pipelines in Brunei. This included developing detailed ecological and human health risk assessments for various decommissioning options.

Marine Ecologist
Performed an evaluation of decommissioning strategies from the environmental perspective for platform resources in the North Sea. Evaluations included understanding contaminated sediments and sub-sea structures related to decommissioning and abandonment activities planned.

Project Principal/Senior Marine Ecologist
Developed Net Environmental Benefit Analysis models for determining effective decommissioning options for offshore assets including central processing platforms, wellhead platforms and pipelines. Efforts included developing impact assessments for air, marine, and benthic resources.

Project Principal/Senior Marine Ecologist
Developed the Decommissioning Environmental Assessment (DEA) document to support the decommissioning of multiple well head, central processing, and sub-sea structures in the Gulf of Thailand. This included detailed field studies and a quantitative evaluation of decommissioning options and methods.

Marine Ecologist
Managed the evaluation of decommissioning options for the Brent Sea platforms. Environmental assessment included a review of all platform assets and life cycle status, biological resources in the North Sea, and incidence of shell mound habitats underneath platforms. Additional studies included the effects of deepwater trawling on biota and long term effects in the oil fields.

Project Principal/Senior Marine Ecologist
Managed the marine sciences and ecological risks associated with the disposition of residual shell mounds from the decommissioning of the 4H oil production platforms located in the Santa Barbara Channel. Led marine science investigations on the mounds, developed monitoring strategies, political strategy with CCC, CSLC, and other agencies, technical frameworks, and project designs for innovative studies to support the CEQA/NEPA process and develop the environmentally superior project alternative.

Project Principal Marine Ecologist
Provided ecological support for determining potential effects to marine resources from decommissioning activities related to potential removal of platforms within the Cook Inlet. Studies included development

of baseline ecological resources, resource mapping, and data evaluations.

OTHER KEY PROJECTS

Program Manager
Served as the primary contact and manager for multi-year service contracts for several U.S.ACE districts. Projects included maintenance dredging projects for over 50 sites throughout California, Oregon, and Hawaii. Managed the disposal and daily operation of the largest contained disposal facility in California at the Galbraith Disposal Area in Oakland, California. Developed study designs, field sampling plans, and supervised field and laboratory activities related to permitting of ACOE projects.

Program Manager
Managed multi-year sediment projects including maintenance dredging, new construction dredging, and Port development projects. Supervised field studies involved in dredging and risk assessment activities related to contaminated sediment issues for the Port. Projects included serving as the program manager for the West Basin, Channel Two, Pier T, and Pier S deepening and terminal development projects. Activities included regulatory interactions, sampling plan designs, field studies, and laboratory toxicity studies.

Program Manager
Supervised staff in regulatory interactions, sediment quality guideline development, and permitting for routine maintenance dredging and new construction projects for the Port over multiple years. Projects included sediment studies at all Port terminals, supervision of dredging activities, and disposal operations. Served as manager for field activities for the 50-foot deepening project and Middle Harbor re-development that included collection and analysis of over 250 sediment samples.

Program Manager
Managed sediment projects for the Port that included sediment sampling, testing, and long-term evaluations. Projects included maintenance dredging, and new construction dredging at various Port properties including municipal marinas, bulk loading terminals, and container terminals. Management tasks included development of detailed management plans for contaminated sediments, regulatory interactions, supervising field, and laboratory studies, and development of sediment action plans for sites at risk.

Project Toxicologist
Designed field and laboratory studies to investigate sediment quality for the future home-porting of Navy assets in Pearl Harbor and San Diego.

Program Manager
Managed the long-term study designed to detect toxicity in sediments from sunken Navy target ships at depths of over 2000 feet. Designed field study programs, developed innovative protocols, engineered field sampling equipment, and provided laboratory support.

Principal Investigator
Managed the data collection, interpretation, and statistical analysis of a long-term deep sea study of the effects of offshore discharge of drilling fluids. This study included placement of settling traps and in-situ bioassays at a depth of over 600 feet in the Santa Barbara Channel.

Principal Investigator
Analyzed spatial and temporal distributions of toxicity around a municipal-industrial wastewater discharge. Designed and led field and laboratory studies to characterize waste plumes using sediment pore-water toxicity, water chemistry, and benthic diversity data.

Southern California. Principal Investigator
Analyzed the ecological effects of oil-related effluents. Designed and led both field and laboratory studies to investigate effects on reproduction, growth, and development of marine invertebrates from produced water discharges.

Catalina Island, CA. Principal Investigator
Conducted studies to quantify the level fish mediated heavy metal importation onto rocky reefs.

PUBLICATIONS (SELECTED)

- Krause, P.R., and J. Baquiran. 2023. Subtidal intake systems for deepwater desalination. Keynote address presented at the 2023 CalDesal Conference, Sacramento, CA.
- Baquiran, J. and Krause, P. (2022) Important Considerations for Pharmaceutical Development and Use in Aquaculture. Aquaculture 2022 Conference, San Diego.
- Krause, P.R., and J. Baquiran. 2019. Determining environmentally superior decommissioning options for hard and flexible pipelines. Society of Petroleum Engineers, SPE Journal. 2019.
- Jagerroos, S. and P.R. Krause. 2016. Rigs-to Reefs; Impact or enhancement on marine biodiversity. Journal of Ecosystem and Ecography. 16-438.
- Krause, P.R., M. Hartley, and W. Gala. 2015. Mitigation and restoration to enhance biodiversity. Presented at the International Association of Impact Assessment conference, Florence, Italy. 2015.
- Krause, P.R. 2014. Ecological value of leave-in-place and reefing options in temperate environments: Case studies from decommissioning projects in California, U.S.A. Society of Petroleum Engineers, SPE Journal. 2014.
- Krause, P.R. J. Holder, and E. Buchak. 2013. Environmental baseline studies in the IA: Form and Function. Presented at the International Association of Impact Assessment conference, Calgary, Alberta, Canada. 2013.
- Krause, P.R., R. Hill, and W.R. Gala. 2012. The Ecological resources on shell mound habitats surrounding platform decommissioning sites in the Santa Barbara Channel, California, U.S.A. Society of Petroleum Engineers, SPE Journal. 2012.
- Krause, P.R. 2010. A new artificial reef in Santa Barbara, California: An example of environmental enhancement from oil field decommissioning activities. Presented at the Ecological Society of America, 2010 Annual Conference, Pittsburgh, PA.
- Krause, P.R., R. W. Hill, W.R. Gala, and S. Larew. 2010. Determining the ecological value of fish resources at platform decommissioning sites using ROV and trapping techniques in the Santa Barbara Channel, U.S.A. Society of Petroleum Engineers, SPE Journal 2010.
- Krause, P.R. 2002. Ecological toxicology of produced water. Proceeding, 2002 Information Transfer Meeting, US Department of the Interior, Minerals Management Service, Gulf Coast Region.
- Raimondi, P.T., A.M. Barnett, and P.R. Krause. 1997. The effects of drilling muds on marine invertebrate larvae and adults. Env. Tox. and Chem.16(6):1218-1228.
- Krause, P.R. 1995. Spatial and temporal variability in receiving water toxicity near an oil effluent discharge site. Arch. Env. Contam. Toxicol. 29:523-529.
- Krause, P.R. 1994. Effects of produced water on gametogenesis and gamete performance in the purple sea urchin (*Strongylocentrotus purpuratus*). Env. Tox. and Chem. 13(7): 1153-1161.

RAMBOLL

ENVIRONMENT & HEALTH

LINDA MARTELLO

Manager
PhD Toxicology / Ecological Risk Assessment

EXPERIENCE HIGHLIGHTS

Dr. Linda Martello has over 20 years of experience in environmental toxicology and risk assessment. As a terrestrial and aquatic toxicologist, Dr. Martello is responsible for project management and technical research involving the ecological impacts associated with chemical contamination of aquatic and terrestrial environments, and species-specific toxicity of chemicals to a wide variety of aquatic and terrestrial organisms. Linda's expertise includes chemical acute and chronic toxicity thresholds to marine and freshwater organisms, establishing species-specific ecotoxicity benchmarks for chemicals and chemical mixtures, ecological risk assessment of persistent, bioaccumulative organic pollutants (e.g., dioxins and PCBs) and metals (e.g., chromium and mercury), food web modeling, chemical fingerprinting, chemical environmental fate, speciation of metals in aquatic systems and geochemistry of metals in aquatic systems.

REPRESENTATIVE PROJECTS

- Project manager for three ecological risk assessments at the Nevada Environmental Response Trust CERCLA Site in Henderson, Nevada. The ERAs are underway as part of the Remedial Investigation/ Feasibility Study (RI/FS) for the NERT Site to evaluate whether conditions from historical manufacturing activities pose a potential risk to ecological receptors at the Site and surrounding areas. Contaminated groundwater from the Site flows to the Las Vegas Wash, several miles from the site. The Wash contains ESA species including the desert tortoise, Yuma clapper rail, yellow-billed cuckoo and the Southwestern willow flycatcher. A comprehensive field sampling effort was conducted over the course of a year within the Las Vegas Wash to assess potential risk to aquatic and terrestrial wildlife including the ESA species that inhabit the wash. The field effort included the collection of surface water, sediment, sediment pore water, bank soils, benthic invertebrate tissue, fish tissue, and benthic invertebrate community assessment.
- Project manager for four baseline ecological risk assessments (BERA) prepared for the Salt River Project (SRP) Navajo Generating Station (NGS). The evaluation of impacts to species federally listed as endangered was conducted for NEPA documentation, including the ecological importance and distribution of the affected species, and intensity of potential impacts of the generating station on these species. The ERA team prepared five comprehensive ecological risk assessments to support a NEPA Environmental Impact Statement (EIS) and Endangered Species Act (ESA) Section 7 Consultation. The assessment included a comprehensive evaluation of fish species potentially impacted by the generating station. A comprehensive field sampling effort was conducted over the course of 1.5 years within the Lake Powell area to assess potential risk to aquatic and terrestrial wildlife including the ESA species that inhabit the wash. The field effort included the collection of surface water, sediment, sediment

CONTACT INFORMATION

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EDUCATION

1993
BS, Biology
University of California, Santa Cruz

1999
PhD, Environmental Toxicology
University of California, Santa Cruz

MEMBERSHIPS

Society of Environmental Toxicology and Chemistry (SETAC), 1995 – present

pore water, soil, benthic invertebrate tissue, fish tissue, and benthic invertebrate community assessment. The project involved direct collaboration and coordination with the US Fish and Wildlife Service, the US Bureau of Reclamation, and the US EPA.

- Project manager for a comprehensive Baseline Ecological Risk Assessment (BERA) conducted for the Kayenta Mine Complex (KMC) in Kayenta, Arizona. The BERA was designed to evaluate the impacts of mining activities on terrestrial and aquatic habitats within the KMC property. The Kayenta Mine is located on 44,073 acres of leased land within the boundaries of the Hopi Tribe and Navajo Nation on a highland plateau called Black Mesa in Northeast Arizona. The mine supplies approximately 7.5 million tons of low-sulfur thermal coal annually to the Navajo Generating Station (NGS) near Page, Arizona. The KMC BERA included an evaluation of representative species expected to occur in the area as well as effects to Native American, state and federally listed species. The field effort for the mine included sampling in several permanent ponds present on the mine property were key focus areas for the ERA in regard to direct impact to wildlife and the bioaccumulation of chemicals through the food web with a particular focus on fish species potentially impacted by mine activities. The project involved direct collaboration and coordination with multiple stakeholders including the Bureau of Reclamation, the Office of Surface Mining Reclamation and Enforcement, the US Fish and Wildlife Service, the Bureau of Indian Affairs, the US Environmental Protection Agency, the Navajo Nation, Hopi Tribe, and National Parks Service.
- Project manager for the ecological risk assessment at the New Idria Mercury Mine CERCLA Site; San Benito County, California. A BERA is being conducted as part of the Remedial Investigation/Feasibility Study (RI/FS) for the New Idria Mercury Mine Site to evaluate whether current site conditions pose a potential risk to ecological receptors at the Site and surrounding areas. In 2011. New Idria was listed as a US EPA Superfund Site due to unchecked mercury run-off and contamination. Elevated levels of mercury have been found downstream of the town, as well as significant levels of mercury and other metals found within the tailings piles on Site. The BERA includes the identification and evaluation of impacts to listed species for NEPA documentation, including potential impacts to fish in the San Carlos Creek and downstream. As such, the BERA will support requirements under NEPA and Endangered Species Act Section 7 Consultation.
- Project leader in the execution of an ecological and human health risk assessment for a CERCLA (Superfund) Site in the lower Hackensack River, N.J. The risk assessment included consideration of sediment dwelling invertebrates, forage and predatory fish, omnivorous and carnivorous birds, and recreational and subsistence anglers, in a manner consistent with technical approaches widely recognized by USEPA, United States Navy (US Navy), United States Army Corps of Engineers (USACE), and state environmental agencies. A key aspect of the evaluation was the evaluation of essential fish habitat and migratory fish species entering the area and the potential impacts of historical manufacturing activities to these species. Chemicals evaluated in the risk assessment included metals, pesticides, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and polychlorinated dibenzo-p-dioxins and furans (PCDD/F).
- Conducted field work involving the transfer of PCBs from mother to pup among Northern Elephant Seals (*Mirounga angustirostris*), at Ano Nuevo Island, California. The project required the collection of blood, blubber and milk from Northern Elephant Seals to determine PCB loads as well as transmission of PCBs and other lipophilic compounds (polyaromatic hydrocarbons [PAHs], pesticides) from mother to pup through colostrum/milk. Additionally, an immunosorbent assay was used to determine antibody concentrations and the impact of PCB exposure on serum concentrations of total immunoglobulin. This work required expertise with sophisticated pharmacokinetic models in order to understand PCB mechanisms of action among marine mammals.
- Conducted an evaluation of PCB loads in California versus Alaskan Sea Otters. Liver samples from adult male sea otters were collected to compare PCB, pesticides, polychlorinated dibenzo-p-dioxins (PCDDs); and polychlorinated dibenzofurans (PCDFs) levels in three different sea otter populations: California,

Aleutian Islands and Southeast Alaska. The purpose of this study was to determine if organochlorine contaminants could be contributing to the depressed rate of increase in the California sea otter population.

- Performed necropsies on various marine mammals (elephant seals, California sea lions, harbor seals, Pacific white-sided dolphins, sea otters) for tissue harvesting and evaluation of cause of death of stranded marine mammals along the coast of California including chemical evaluations.
- Project manager for a CEQA review of biological resources potentially impacted by the Phillips 66 oil refinery in Rodeo, CA. The project required an in-depth analysis of migratory and sensitive fish species as well as an evaluation of essential fish habitat within the vicinity of the refinery. Fish species ranges, critical habitat, foraging behaviors and movement patterns were included in the evaluation.
- Project manager for a biological resources and wetlands assessment to ascertain the presence of sensitive resources on a property located in the California Bay Delta. The biological assessment included a comprehensive evaluation of the presence or absence of special status species (including T&E species) within the property boundaries. The wetlands evaluation focused on historical waterbodies, potential ponding areas and vegetation types that inform the potential presence USACE jurisdictional wetlands. The assessment included a complete document review followed by a multi-day focused site reconnaissance for evidence of key T&E species. The site reconnaissance also included the use of a Phantom 4 Pro Drone to catalogue topographic and vegetation data. The VARI (Visible Atmospherically Resistant) Index was used to highlight vegetation location, type and health.

Additional Relevant Project Experience

- Project leader in the execution of an ecological risk evaluation at a lead smelter site on the Mississippi River. The site required a detailed evaluation of metals and potential risk to aquatic and terrestrial receptors and required a thorough evaluation of potential risks to the adjacent wetland. A weight of evidence approach was used to understand potential impacts of Site activities on ecological resources at the Site. This evaluation included a comparison of concentrations of chemical constituents in sediment and surface water against available screening criteria to understand potential risks to receptors from Site related chemicals; an evaluation of the bioavailable fraction of metals using AVS:SEM to determine potential ecological impacts; an evaluation for the presence of habitat on-site that could attract ecological receptors,
- Technical lead in collaboration with a multi-firm team on an ecological risk assessment for a large marine terminal in the Patapsco River, Baltimore, Maryland. The ERA was designed to evaluate the potential ecological risks associated with exposure to chromium in the sediments and surface water in the Patapsco River. This ERA focuses on hexavalent chromium [Cr(VI)], trivalent chromium [Cr(III)], and chrome ore processing residue (COPR) constituents (aluminum, calcium, iron, magnesium, manganese, and vanadium).
- Technical lead for a Sediment Quality Triad (SQT) study consisting of chemical characterization in sediment, sediment toxicity and bioaccumulation testing, and benthic community assessments for the Lower Hackensack River, New Jersey. Chemistry data in sediment and porewater were evaluated based on the equilibrium partitioning approach and other published information to investigate the potential for chemical effects on benthic organisms and communities. Relationships were supported by laboratory toxicity and bioaccumulation experiments to characterize chemical effects and bioavailability. Benthic community results were evaluated using a regional, multimetric benthic index of biotic integrity and four heterogeneity indices.
- Project manager for a biological resources and wetlands assessment to ascertain the presence of sensitive resources on a property located in the California Bay Delta. The biological assessment included an evaluation of the presence or absence of special status species (including T&E species) within the property boundaries. The wetlands evaluation focused on historical waterbodies,

potential ponding areas and vegetation types that inform the potential presence USACE jurisdictional wetlands. The assessment included a complete document review followed by a multi-day focused site reconnaissance for evidence of key T&E species. The site recon also included the use of a Phantom 4 Pro Drone to catalogue topographic and vegetation data. The VARI (Visible Atmospherically Resistant) Index was used to highlight vegetation location, type and health.

- California Department of Fish and Game. Used SCUBA to conduct surveys of seafloor habitats and associated organisms, collected data on species-habitat associations, and studied ecosystem relationships along the California coast and Channel Islands. In a separate study, abalone surveys were conducted from Morro Bay to Davenport, CA to evaluate population trends of four species of abalone.
- Technical lead for a baseline ecological risk assessment at a Hudson River Manufactured Gas Plant Superfund Site contaminated with metals and polycyclic aromatic hydrocarbons (PAHs) to determine potential impacts to aquatic and terrestrial receptors. The BERA required the development of a sophisticated tissue uptake and food web model using equilibrium partitioning to estimate risks to wildlife and included multiple lines of evidence to evaluate ecological risks. Completion of the project in 2012 included regular communication and collaboration with EPA scientists and risk assessors regarding complex risk assessment issues at the site. A comprehensive review of the literature was required to compile available ecotoxicological data for the food web model.

PUBLICATIONS

Wenning, R.J. and L.B. Martello 2015. Chapter 4. Levels and Trends of Dioxins, PCBs and Other POPs in Abiotic Compartments. *In: Handbook of Environmental Chemistry - Dioxin and Related Compounds: Sources, Levels, Trends and Fate in the Environment; Special volume dedicated to honor Dr. Otto Hutzinger; Alaee et al. (Eds).*

Wenning, R.J. and L.B. Martello 2014. Persistent Organic Pollutants in Marine and Freshwater Environments. In: Environmental Forensics for Persistent Organic Pollutants, 1st Edition.

Martello L, Sorensen M, Fuchsman P, Wenning R. 2007. Chromium geochemistry and bioaccumulation in sediments from the lower Hackensack River, New Jersey, USA. Arch Environ Contam Toxicol 53 (3), 337-350.

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Martello, L.B., R.S. Tjeerdema, 1999. The combined effects of chemical and natural stressors on Chemiluminescence activity in two species of abalone. Aquatic Toxicol. (in press)

Moore, D.W., Diener, D., Anghera, M., Sorensen, M., Martello, L., Wenning, R.J. 2004. Weighing the Evidence: Delineation of Potential Sources of Toxicity Using Multiple Lines of Evidence (August 2004; Submitted to SETAC November 2004 Conference, Portland, Oregon).

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Tjeerdema, R.S., W.S. Smith, L.B. Martello, R.J. Kauten and D.G. Crosby, 1996. Interactions of chemical and natural stresses in the abalone (Haliotis rufescens) as measured by surface-probe localized 31P NMR. Mar. Environ. Res. 42, 369-374.

Wenning RJ, LB Martello, A Prusak. 2010. Dioxins, PCBs, and PBDEs in aquatic organisms. In: J Meador (ed). Contaminants in Wildlife. Second edition. Taylor & Francis, Philadelphia PA. (in press).

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Wenning R.J., Martello, L.B., Von Burg, A., Pekala, J., Leitman, P., Sorensen, M. 2004. Polychlorinated dibenzo-p-dioxin, furan and biphenyl Contamination in Hackensack River, Passaic River, and upper Newark Bay Sediments (August 2004; Submitted to SETAC November 2004 Conference, Portland, Oregon).

RAMBOLL

ENVIRONMENT & HEALTH

SHANNON FLUHARTY, MS

Senior Consultant

Ms. Fluharty has over 6 years of experience in the environmental remediation/restoration, aquatic, and environmental, health and safety services industries. Her academic specialty is in marine ecology, and natural resource economics. She has experience assisting with the development of complex sampling procedures in both marine and terrestrial environments. Ms. Fluharty has also has experience with intensive field efforts including biological and terrestrial surveys and collecting soil, water, and shellfish samples, among others.

EDUCATION

MS, Agricultural and Applied Economics, Virginia Tech, Blacksburg, VA, USA, 2021

BA, Environmental and Organismal Biology, Christopher Newport University, Newport News, VA, USA, 2016

FIELD SAMPLE COLLECTION EXPERIENCE

Senior Ecologist
Participated in a pH sampling effort for streams and creeks on a Superfund mining site in California. The project effort required reconnaissance of potential stream sampling locations for a planned survey event and collection of pH data to determine ecological suitability of reference points along the target streams.

Project Scientist
Contributed to developing sample procedures (SAP) for a plastics, metals, mercury and NORM sampling effort for oil and gas platforms in Australia. The collected samples contributed to a greater ecotoxicological study.

Research Biologist
Collected oyster samples along the Lynnhaven River for a Virginia oyster population restoration study. Activities consisted of field collection and laboratory measurement of oysters, mussels, and snails associated with oyster reefs lining riparian beaches.

Environmental Scientist
Participated in stormwater sample collection efforts throughout southern California for a major distribution client with hundreds of locations.

Project Scientist
Participated in multi-week soil sampling remediation project in rural North Carolina. Project activities required use of hand augers and best practice sampling technique for a contaminated soil remediation effort.

CONTACT INFORMATION

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FIELD SURVEY EFFORTS

Environmental Scientist
Assisted with a series of bird survey efforts prior to tree clearing for powerline and gas line Right of Ways (ROWs) at a series of locations throughout Virginia and North Carolina.

Field Biologist
Served as field biologist for a natural gas pipeline construction project in West Virginia. Activities included survey and identification of the cheat mountain salamander and construction of designated habitat areas to protect any individuals found from construction activities.

Project Scientist
Lead various Phase I site investigations on rural properties throughout Maryland, Virginia, North Carolina, and West Virginia. Activities consisted of photographic evidence collection, surveying of wetlands and site features for further investigations, and circumnavigation of rural undeveloped properties.

Communications Scientist
Conducted stakeholder outreach surveys of Virginia watermen to determine how catch was being reported in the crabbing and shellfish industry throughout Virginia. Results of the survey led to promotion of the electronic harvest reporting for watermen in Virginia.

Conservation Scientist
Participated in numerous invasive species removal efforts throughout California to restore California recreational areas, conservation areas, and sensitive habitats. Participation in these survey and remediation activities required Wildlife First Aid certification and plant identification skills.

Research Biologist
Participated in marine mammal and coral reef survey effort in St. Kitts and Nevis, British West Indies. Activities consisted of shoreline marine mammal observational surveys and cross-sectional fish identification data collection while scuba diving.